

TRANSACTIONS

OF THE

DUBLIN SOCIETY.

VOL. VI.

Hoc anno (1736) ad ornandam agriculturam Societas coaluit
Dublini, quæ hebdomadatim suas adnotationes edidit, & prima est
Societatum, quæ ad agricolendi artem colendam coaluerunt.

ALBERTUS VON HALLER. *Bibliotheca Botanica*, p. 287.

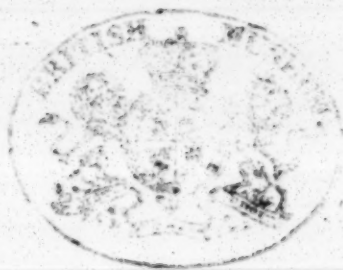
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Dublin.

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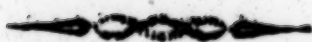
1810.

THE Society desire it to be understood that, as a body, they are not responsible for any opinion or representation of facts contained in the following papers ; and will be much obliged to any gentleman, farmer, or other person, that will be pleased to point out any error or improvement in the several matters treated of, by letters addressed to their Acting Secretary, BUCKNALL M'CARTHY, Esq. Hawkins'-street, Dublin.

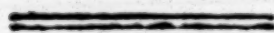


43.
8. 10.
576.

CONTENTS.



	Page
<i>PREMIUMS offered by the Dublin</i>	
<i>Society, in 1810</i> - - -	1
<i>Premiums offered by the London</i>	
<i>Society, in 1810</i> - - -	5—30



<i>Diary of the Weather at the</i>	
<i>Botanic Garden,</i>	
<i>_____ for the year</i>	
1806 - - - -	1
<i>_____ for the year</i>	
1807 - - - -	47
<i>_____ for the year</i>	
1808,—by Mr. Underwood -	90
<i>Meteoric observations made in and</i>	
<i>near the city of Londonderry, in</i>	
<i>the year 1805, by Dr. Patterson</i>	137—160
	<i>Sketch</i>

	Page
<i>Sketch of Lectures on Meadow and Pasture Grasses, by Dr. Wade, Professor of Botany</i> - -	1—55
<i>Sketch of Lectures on Artificial, or Sown Grasses, by the same</i> -	1—51
<i>Quercus, or a Treatise on Oaks, by the same</i> - - - -	
<i>Preface and Introduction to Quercus, &c.</i> - - - -	i—xxxix
<i>Quercus, &c.</i> - - - -	1
<i>Observations on the cultivation and growth of Oak Timber, by the Rev. Richard Yates, F. A. S.</i> -	75—85
<i>Observations on the sowing of Spring Wheat</i> - - - -	1
<i>On the improvement of the Circumferentor, by Mr. Freeman</i> -	47
<i>Observations on Mr. Freeman's Paper, by Mr. Lynch, Professor of Mechanical Philosophy</i> - -	67
	<i>A Letter</i>

CONTENTS.

v

Page

<i>A Letter to General Vallancey, V.P.D.S. on the Composition of Bogs, by the Rev. Mr. Hincks -</i>	69
<i>Extracts from Lasius's Observations on the Hartz Mountains, from the German. Continued from Vol. V.</i>	77

PREMIUMS

1871

A letter to General
N. P. L. on the
subject of the
Tomb of the
of the House of
the House of

1810.

PREMIUMS

OFFERED BY THE

DUBLIN SOCIETY,

FOR

AGRICULTURE AND FINE ARTS.

AGRICULTURE.

A Premium of Forty Shillings an acre will be given for the first 750 acres of ground sowed with Hemp seed, on or before the 2d day of May, in the year 1810; and if a greater quantity of ground should be claimed for than 750 acres, the sum of £1500 will be rateably divided amongst the claimants.

To entitle claimants to the above premium, the following terms must be complied with:

An Affidavit of the claimant that the ground was in sufficient order for sowing Spring corn, and that there were sowed four bushels of good Hemp seed on each and every acre so claimed for, on or before the 2d day of May, 1810; the aforesaid claim; together with a certificate of a neighbouring Magistrate upon view, to be sent in to the Secretary's Office, on or before the 1st day of December, 1810.

N. B. The Society think it necessary to recommend five bushels; but, if very carefully sowed and covered, four may answer; and it is requested, that an accurate return of the produce may be made with each claim.

FINE ARTS.



SCHOOL FOR FIGURE DRAWING.

For a group of Figures, not less than three of thirteen inches long, from nature.

For a single Academy Figure, from nature.

For the best drawing, from the round.

For the next best ditto.

For the best drawing, from the flat.

For the second best ditto.

SCHOOL FOR LANDSCAPE AND ORNAMENT.

For the best drawing of trees, from nature, not fewer than two, or of such other subject as the Committee shall select, on a sheet of Royal paper.

For the next best.

For the best drawing of Ornament in chalk, on a sheet of Royal paper.

For the next best.

For the best drawing of ditto, in Indian ink.

For the next best.

For the best drawing of flowers, in Colours, on a sheet of Royal paper.

SCHOOL FOR ARCHITECTURE.

For the best Design and drawing of the regular Orders, or such other Architectural subjects as shall be directed.

For the next best.

N. B. The blank spaces will be filled up by the Committee of Fine Arts, at their discretion, on the day of adjudication.

TO GENERAL VALLANCEY,
VICE PRESIDENT OF THE DUBLIN SOCIETY.

July 9, 1810.

SIR,

By direction of the Society instituted for the encouragement of Arts, Manufactures, and Commerce, I return their thanks to the Dublin Society, and to you, for various specimens of Irish marbles, which arrived here safe after being long detained upon the road, and will be fixed in the Great Room.

I have now the honor to inclose you a List, just printed, of the premiums offered by this Society for their next Session, and which are equally open to the claimants of Ireland, as to those of Great Britain, on the certificates and claims being sent here in due time.

I shall be always ready to pay any attentions in my power to any of your friends, who may wish to call at the Adelphi, and I remain, with respect and esteem, Sir,

your obedient Servant,

CHARLES TAYLOR, M. D. SEC.

Society of Arts, &c. Adelphi, London.

TO CENTRAL TALLENTS
AND PRESIDENT OF THE TALLENT SOCIETY

1810.

My dear Sir,
The Directors of the Society intended for the encourage-
ment of Art, & Science, and Commerce, to return their
thanks to the Tally Society, and to you, for various specimens
of their industry, which were sent me after being long de-
livered upon the road, and will be laid in the Great Room.

I have now the honor to inclose you a list, just printed, of
the specimens, which I have for their next Session, and
which are open to the donors of Ireland, as to those
of Great Britain, on the specimens, and others being sent here.

I am, Sir, very respectfully,
Your obedient servant,
J. T. Tally

J. T. Tally

J. T. Tally

PREMIUMS offered in 1810, by the SOCIETY instituted at London, A. D. 1754, for the Encouragement of Arts, Manufactures, and Commerce, extending to Ireland.

PREMIUMS IN AGRICULTURE.

Article I. ACORNS.

FOR having set between the first of October, 1808, and the first of April, 1809, the greatest quantity of land, not less than ten acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

2. For the second greatest quantity of land, not less than five acres, set agreeably to the above conditions; the silver medal.

Certificates of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks on each acre, to be delivered to the Society on or before the first Tuesday in December, 1810.

3. **RAISING OAKS.** To the person, who shall have raised, since the year 1806, the greatest number of oaks, not fewer than five thousand, either from young plants or acorns, in order to secure a succession of oak timber in this kingdom; the gold medal.

4. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates that there were on the land, at least, the number of young oak trees required, in a thriving condition,

two years after the planting, with an account of the methods pursued in making and managing the plantation, to be produced to the Society on or before the first Tuesday in January, 1811.

5. **ASCERTAINING THE BEST METHOD OF RAISING OAKS.** To the person, who shall ascertain in the best manner, by actual experiments, the comparative merits of the different modes of raising oaks for timber, either from acorns set on land properly dug or tilled, from acorns set by the spade or dibble, without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover: or from young plants previously raised in nurseries, and transplanted; regard being had to the expense, growth, and other respective advantages of the several methods; the gold medal.

The *accounts* and proper *certificates*, that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the first Tuesday in November, 1810.

6. **CHESNUTS.** For having sown or set, between the first of October, 1808, and the first of April, 1809, the greatest quantity of land, not less than six acres, with Spanish chesnuts, with or without seeds, cuttings, or plants of other trees, adapted to such soil, at the option of the candidate; and for effec-

tually fencing and preserving the same, in order to raise timber: the gold medal.

7. For the second greatest quantity, not less than four acres: the silver medal.

Certificates of sowing or setting, agreeably to the above conditions, and that there are not fewer than three hundred chesnut plants in a thriving state, on each acre, to be delivered to the Society on or before the first Tuesday in January, 1811.

8. **ELM.** For having planted the greatest number of the English elm, not less than eight thousand, between the twenty-fourth of June, 1808, and the twenty-fourth of June, 1809; and for having effectually fenced and preserved the same in order to raise timber; the gold medal.

9. For the second greatest number, not less than five thousand; the silver medal.

Certificates of having planted agreeably to the above conditions, that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants, to be delivered to the Society on or before the first Tuesday in April, 1811.

10. **LARCH.** For having planted out, between the twenty-fourth of June, 1807, and the twenty-fourth of June, 1808, the greatest number of larch trees, not fewer than five thousand, and for having effectually fenced and preserved the same in order to raise timber; the gold medal.

11. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in December, 1810.

N. B. The larch trees may be planted, either mixed with other trees, or by themselves, as may best suit the convenience of the planter.

12. **ASH.** For having sown or set, in the year 1806, the greatest quantity of land, not less than six acres, with ash for timber, with or without seed, cuttings, or plants, of such other trees as are adapted to the soil; the gold medal.

13. For the next greatest quantity, not less than four acres; the silver medal.

Certificates of the sowing or setting, agreeably to the above conditions, that there are not fewer than six hundred ash plants on each acre, in a thriving and healthy condition, two years at least after the sowing or setting, with a general account of the methods used in making the plantation; to be delivered to the Society on or before the last Tuesday in December, 1810.

N. B. It is the intention of the Society, that such lands only as are not calculated for the purposes of husbandry, should be employed for the purposes specified in these advertisements.

14. **FOREST TREES.** To the person, who shall have enclosed and planted, or set, the greatest number of acres (not less than ten) of land, that is incapable of being ploughed, such as the borders of rivers, the sides of precipices, and any land that has too many rocks, or that is not calculated to repay the expense of tillage, owing to the surface being too hilly, mountainous, or otherwise unfit for tillage, with the best sorts of forest trees, namely, oak, Spanish chesnuts, ash, elm, beech, alder, willow, larch, spruce, and silver fir, with or without screens of Scotch fir, adapted to the soil, and intended for timber trees, between the first of October, 1807, and the first of April, 1808; the gold medal.

15. For the second greatest quantity of land, not less than seven acres: the silver medal.

A particular account of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper certificates that they were in a healthy and thriving state two years at least after making the plantation, to be delivered to the

Society on or before the first Tuesday in December, 1810.

N. B. With the above forest trees, seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

16. NORWAY FIR SEEDLINGS. To the person, who shall have planted in the United Kingdom, during the year 1810, the greatest number, not less than two thousand, of red wood and white wood, Norway fir seedlings, at sufficient distances from each other, to stand for timber trees; the gold medal.

Certificates of the number of plants, that they were in a thriving state two years at least, after they were planted out, with a general account of the method used in making the plantation, to be delivered to the Society on or before the first Tuesday in December, 1813.

N. B. It is recommended to plant the seedlings of about three or four years growth, and in a moderately good soil, somewhat sheltered; the wood from the district of Christiania is esteemed the best for carpenters and joiners use; and for spars and upers the trees, near to Long Sound, are most valued.

17. WALNUT TREES. For having planted the greatest number of walnut trees, not less than one thousand, between the 24th of June, 1808, and 24th of June, 1809, and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

18. For the next greatest number, not fewer than five hundred; the silver medal.

Certificates of having planted agreeably to the above conditions, and that the plants were in a healthy and thriving state, two years at least after making the plantations, and specifying the distance of the plants from each other, to be delivered to the Society on or before the first Tuesday in April, 1811.

The candidates for planting all kinds of trees are to produce certificates that the respective plantations are properly fenced

and secured, and particularly to state the condition of the plants at the time of signing such certificates. Any information, which the candidates for the foregoing premiums may choose to communicate, relative to the methods made use of in forming the plantations, or promoting the growth of the several trees, or any other observations, that may have occurred on the subject, will be thankfully received.

19. SECURING PLANTATIONS OF TIMBER TREES, AND HEDGE ROWS. To the person, who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method of securing young plantations of timber trees, and hedge rows, from hares and rabbits, as well as sheep and large cattle, which at the same time shall be least subject to the depredations of wood-stealers; the silver medal.

The accounts, and certificates of the efficacy of the method, to be produced to the Society on or before the first Tuesday in December, 1810.

20. COMPARATIVE CULTURE OF WHEAT, BROAD-CAST, DRILLED, AND DIBBLED. For the best set of experiments, made on not less than twelve acres, four of which to be sown broad-cast, four drilled, and four dibbled, the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat; the gold medal.

It is required, that every operation and expense of each mode of culture be fully described: and that proper certificates of the nature and condition of the land, on which the experiments were made, together with an account of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in February, 1811.

21. BEANS AND WHEAT. To the person, who, shall have dibbled or drilled between the first of December, 1809, and the first of April, 1810, the greatest quantity of land, not less than ten acres, with beans, in equidistant rows, and hoed the intervals twice or oftener, and shall have sown the same land with

Premiums in Agriculture.

wheat in the autumn of the year 1809; the gold medal.

It is required, that an *account* of the sort and quantity of beans, the time of dibbling or drilling, and of reaping or mowing them, the produce per acre thrashed, the expense of dibbling or drilling, hand or horse hoeing, the distance of the rows, and the quality of the soil, together with *certificates* of the number of acres, and that the land was afterwards actually sown with wheat, be produced on or before the second Tuesday in March, 1811.

22. BEANS. To the person who, in the year 1810, shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse-beans or tick-beans, that will ripen their seeds before the 21st of August; the silver medal.

It is required, that a particular *account* of the bean, the cultivation, and the expense attending it, with proper *certificates* of the nature and condition of the land, on which the experiments were made, together with an *account* of the produce, the weight per Winchester bushel, and a sample of not less than a peck, be produced to the Society on or before the first Tuesday in December, 1810. It is apprehended that, if a bean should be brought into cultivation with the habits of the hotspur, or other early peas, it would in a great measure escape the danger arising from the collier-insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat. The *accounts* and *certificates* to be delivered on or before the first Tuesday in December, 1810.

23. PARSNIPS. To the person, who in the year 1810, shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the sole purpose of feeding cattle or sheep; the gold medal.

Certificates of the quantity of land so cultivated, with a particular *account* of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the pars-

nips, and the advantages resulting from the practice, to be produced to the Society on or before the second Tuesday in February, 1811.

24. BUCK WHEAT. To the person, who shall cultivate the greatest quantity of land with buck wheat, not less than thirty acres; the gold medal.

It is required, that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, the manner of reaping it, thrashing it, and housing the grain; with proper *certificates* of the nature and condition of the land, on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year, together with an *account* of the produce, and a sample of the seed, not less than a quart, be produced to the Society on or before the second Tuesday in January, 1811.

25. For the next greatest quantity, not less than fifteen acres, on similar conditions; the silver medal.

Information respecting its application to the feeding of cattle, hogs, and poultry, and other of its uses, is also desired. It is known to be particularly serviceable in furnishing honey to bees.

26. BEES, WAX, AND HONEY. To the person, who shall erect, previous to the first day of September, 1810, an apiary containing the greatest number of hives or boxes stocked with bees, not less than thirty; the silver medal or twenty guineas.

27. For the next greatest number, not fewer than twenty stocks; ten guineas.

Proper *certificates* of the number of stocks, and that they have been in the possession of the claimant during the preceding summer, to be produced to the Society on or before the first Tuesday in March, 1811.

28. RAISING GRASS SEEDS. To the person, who shall raise the greatest quantity of each of any of the following named grass seeds. *viz.*—Meadow fox-tail (*alopecurus pratensis*), sweet-scented vernal grass (*anthoxanthum odoratum*), Timothy grass (*phleum pratense*), mea-

dow fescue grass (*festuca pratensis*), smooth-stalked meadow grass (*poa pratensis*), rough stalked meadow grass (*poa trivialis*); the silver medal.

It is required that *certificates* from persons, who have viewed them in a proper state, to identify that they are one or other of the seeds above-mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the first day of February, 1811.

29. PRESERVING TURNIPS. To the person, who shall discover to the Society the best and cheapest method of preserving turnips perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

It is required that a full and accurate account of the method employed, and the expense attending the process, together with *certificates* that the produce of four acres at the least have been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of February, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips; and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the first Tuesday in December, 1810.

30 For the next in quantity and merit, on not less than two acres; the silver medal.

31. PRESERVING CABBAGES. To the person, who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

32. For the next in quantity and merit, on not less than two acres; the silver medal.

Conditions the same as for preserving turnips, Art. 29.—And the *accounts* to be produced on or before the first Tuesday in December, 1810.

33. PRESERVING CARROTS, PARSNIPS, OR BEETS. To the person, who shall discover to the Society the best and cheapest method of preserving carrots, parsnips, or beets, perfectly sound, and in every respect fit for the purpose of supporting horses, and fattening sheep and neat cattle, during the months of February, March, and April; the gold medal.

Conditions the same as for preserving turnips, Art. 29. And the *accounts* to be delivered in on or before the first Tuesday in December, 1810.

34. For the next in quantity and merit, on not less than two acres: the silver medal.

PRESERVING POTATOES. To the person, who shall discover to the Society the best and cheapest method of preserving potatoes, two or more years, perfectly sound, without vegetating, and in every other respect fit for the purpose of sets and the use of the table, and consequently of supporting and fattening cattle; the gold medal, or thirty guineas.

It is required that a full and accurate account of the method employed, and the expense attending the process, with *certificates* that one hundred bushels at the least have been preserved according to the method described, and that one or more bushels of the same potatoes have been set, and produced a crop without any apparent diminution of their vegetative power, and also that they have been used at table, with entire satisfaction to the person who eat of them, together with a sample of one bushel, be sent to the Society on or before the first Tuesday in December, 1810.

36. For the next greatest quantity, not less than fifty bushels; the silver medal.

37. MAKING MEADOW-HAY IN WET

WEATHER. To the person, who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of making meadow-hay in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than fifty-six pounds of the hay; and *certificates* that at least the produce of six acres of land has been made according to the method described, and that the whole is of equal quality with the sample; to be produced on or before the first Tuesday in January, 1811.

38. HARVESTING CORN IN WET WEATHER. To the person, who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and *certificates* that at least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples, to be produced on or before the first Tuesday in January, 1811.

39. GAINING LAND FROM THE SEA. To the person, who shall produce to the Society an account, verified by actual experiment, of his having gained the greatest quantity of land from the sea, not less than fifty acres, on the coast of Great Britain or Ireland; the gold medal.

Certificates of the quantity of land, and that the experiments were begun after the first of January, 1804, to be produced to the Society on or before the last Tuesday in November, 1810.

40. The same premium is extended one year farther.

Certificates to be produced on or before the last Tuesday in November, 1811.

41. IMPROVING LAND LYING WASTE. For the most satisfactory *account* of the best method of improving any of the following soils, being land lying waste or uncultivated, *viz.* clay, gravel, sand,

chalk, peat-earth, or bog, verified by experiments on not less than fifty acres of land; the gold medal.

42. For the next greatest quantity, not less than thirty acres; the silver medal.

It is required that the land, before such improvement, be absolutely uncultivated, and in a great measure useless, and that, in its improved state, it be enclosed, cultivated, and divided into closes.

Certificates of the number of acres, of the quality of the land so improved, with a full *account* of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced on or before the first Tuesday in February, 1811.

43. MANURES. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following manures, used as to top-dressings on grass and corn land, *viz.* soot, coal-ashes, wood-ashes, lime, gypsum, night-soil, or any other fit article; the gold medal. It is required that the above experiments be made between two or more of the above-mentioned manures, and that no less than two acres of land be dressed with each manure.

An *account* of the nature of the soil, quantity, and expense of the manure and crops, with *certificates*, to be produced on or before the last Tuesday in February, 1811.

44. RAISING WATER FOR THE IRRIGATION OF LAND. To the person, who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to, and cheaper than any method now in use; the gold medal, or fifty guineas.

A model, on a scale of one inch to a foot, with *certificates* that a machine at large, on the same construction, has been used, specifying the quantity of water, delivered in gallons per hour,

and the height to which it was raised, to be produced to the Society on or before the first of March, 1811.

45. **PARING PLOUGH.** To the person, who shall invent and produce to the Society a machine or plough for the purpose of paring land preparatory to burning, superior to any hitherto known, or in use for such purpose, and to be worked by not more than one man and two horses; the silver medal, or twenty guineas.

The machine, and *certificates* that at least three acres have been pared by it in a proper manner, to be produced to the Society on or before the first of January, 1811.

46. **MACHINE FOR DIBBLING WHEAT.** To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths; the silver medal and ten guineas.

The machine, with *certificates* that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in January, 1811.

47. **MACHINE FOR REAPING OR MOWING CORN.** For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats, or beans, by which it may be done more expeditiously and cheaper than by any method now practised, provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such a manner that it may be easily gathered up for binding; the gold medal.

The machine, with *certificates* that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in December, 1810. Simplicity and cheapness in the construction of this and the preceding machine, will be considered as principal parts of their merit.

48. **THRASHING MACHINE.** To the person, who shall invent a machine, by which corn of all sorts may be thrashed

more expeditiously, effectually, and at a less expense, than by any method now in use; the gold medal.

The machine, or a model, with proper *certificates* that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1811.

49. **DESTROYING THE GRUB OF THE COCKCHAFER.** To the person, who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, or of preventing or checking the destructive effects, which always attend corn, peas, beans, and turnips, when attacked by those insects; the gold medal.

The accounts with proper *certificates*, to be produced on or before the first Tuesday in January, 1811.

50. **DESTROYING WORMS.** To the person, who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying worms, or of preventing the destructive effects they occasion on corn, beans, peas, or other pulse; the silver medal.

The accounts, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1811.

51. **DESTROYING THE FLY ON HOPS.** To the person, who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known or practised, on not less than four acres of hop ground; the gold medal.

Accounts and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1811.

52. **PREVENTING THE BLIGHT, OR RAVAGES OF INSECTS, ON FRUIT-TREES AND CULINARY PLANTS.** To the person, who shall discover to the Society the most effectual method of preventing the blight or ravages of insects on fruit-trees and culinary plants, superior to

any hitherto known or practised, and verified by actual and comparative experiments; the silver medal.

The *accounts*, with proper *certificates*, to be delivered to the Society on or before the second Tuesday in December, 1810.

53. CURE OF THE ROT IN SHEEP. To the person, who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments; the gold medal.

It is expected, that the candidates furnish accurate *accounts* of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper *certificates*, must be delivered to the Society on or before the first Tuesday in February, 1811.

54. CURE OF THE FOOT-ROT IN SHEEP. To the person, who shall discover to the Society the best and most effectual method of curing the foot-rot in sheep; the silver medal.

It is required that the cure be ascertained by repeated and satisfactory experiments, and the method of performing it be verified by proper *certificates* delivered to the Society on or before the first Tuesday in February, 1811.

55. PREVENTING THE ILL EFFECTS OF FLIES ON SHEEP. To the person, who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies; the silver medal.

It is required that the method be ascertained by repeated experiments, and that a *certificate* of its efficacy be delivered to the Society on or before the first Tuesday in December, 1810.

56. PROTECTING SHEEP. To the person who, in the year 1809, shall protect the greatest number of sheep, not fewer than one hundred, by hovels, sheds, or any other means, and give the most satisfactory account, verified by experiment, of the advantages arising from the practice of protecting sheep from the inclemency of the wea-

ther, by hovels, sheds, or any other means; the gold medal.

A particular *account* of the experiments made, with the advantages arising therefrom, together with the expense, and *certificates* of its utility, to be produced to the Society on or before the first Tuesday in March, 1811.

N. B. It is required that the *certificates* shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

57. CULTURE OF HEMP. The Society, wishing to encourage the growth of hemp for the use of the navy in every part of the united empire, offer to the person, who shall sow with hemp, in drills at least eighteen inches asunder, the greatest quantity of land in any part of the united empire, not less than fifty acres statute measure, in the year 1810, and shall at the proper season cause to be plucked the summer hemp, (or male hemp bearing no seed) and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal.

58. To the person, who shall sow with hemp, in drills at least eighteen inches asunder, the next greatest quantity of land in any part of the united empire, not less than twenty five acres, statute measure, in the year 1810, and shall at the proper season cause the same to be plucked as above-mentioned; the silver medal.

Certificates of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general *account* of the soil, cultivation, and produce, to be delivered to the Society, along with fourteen pounds of the hemp and two quarts of the seed, on or before the second Tuesday in January, 1811.

59. FEEDING OF CATTLE. For the best experiments on stall feeding of cattle (not less than five head) to be continued for the space of twelve months, in order to prove the earliest maturity and greatest propensity to fatten, of the most approved breeds of

cattle in Great Britain, specifying the nature of the food given, together with the daily consumption of each beast, with its weekly increase in weight, and such other observations as may be deemed of consequence; the gold medal.

A full *account* of the methods employed, and of the expenses attending the same, and *certificates* of the sundry matters stated, to be produced on or before the second Tuesday in January, 1811.

PREMIUMS FOR DISCOVERIES AND IMPROVEMENTS IN CHEMISTRY, DYEING, AND MINERALOGY.

60. PRESERVING SEEDS OF VEGETABLES. For the best method of preserving the seeds of plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the first Tuesday in December, 1810; the gold medal, or thirty guineas.

61. PREVENTING THE DRY-ROT IN TIMBER. To the person, who shall discover to the Society the cause of the dry-rot in timber, and disclose a certain method of prevention superior to any hitherto known; the gold medal, or thirty guineas.

The *accounts* of the cause, and the method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the second Tuesday in December, 1810.

62. PRESERVING SALTED PROVISIONS FROM BECOMING RANCID OR RUSTY. To the person, who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from becoming rancid or rusty; the gold medal, or thirty guineas.

A full *description* of the method, with proper *certificates* that it has been found on repeated trials to answer

the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1811.

63. REFINING WHALE OR SEAL OIL. For disclosing to the Society an effectual method of purifying whale or seal oil from the glutinous matter, that incrusts the wicks of lamps, and extinguishes the light, though fully supplied with oil; the gold medal, or fifty guineas.

It is required that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of the claim; and *certificates* that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil, in its unpurified state, and two gallons so refined, to be produced to the Society on or before the second Tuesday in February, 1811.

64. MANUFACTURING TALLOW CANDLES. To the person, who shall discover to the Society a method of hardening or otherwise preparing tallow, so that candles may be made of it, which will burn as clear and with as small a wick as wax candles, without running, and may be afforded at a less expense than any at present made with spermaceti; the gold medal, or thirty guineas.

Certificates that 112lb. of such tallow have been made into candles, and 12lb. of the candles made thereof, to be produced to the Society on or before the second Tuesday in January, 1811.

65. CANDLES FROM RESIN OR OTHER SUBSTANCES. To the person, who shall discover to the Society the best method of making candles of resin, or any other substance, fit for common use, at a price much inferior to those made of tallow only; the gold medal, or thirty guineas.

Six pounds at least of the candles so prepared, with an *account* of the process, to be delivered to the Society on or before the first Tuesday in December, 1810.

66. METHOD OF SEPARATING SUGAR

IN A SOLID FORM FROM TREACLE. To the person, who shall discover to the Society the best method of separating sugar from treacle, in a solid form, at such an expense as will render it advantageous to the public; the gold medal, or fifty guineas.

A quantity of the sugar so prepared, in a solid form, not less than thirty pounds weight, with an *account* of the process, and *certificates* that not less than one hundred weight has been so prepared, to be produced to the Society on or before the first Tuesday in February, 1811.

67. INCREASING STEAM. To the person, who shall invent and discover to the Society a method, verified by actual experiments, of increasing the quantity or force of steam, in steam-engines with less fuel than has hitherto been employed, provided that in general the whole amount of the expenses in using the steam-engines may be considerably lessened; the gold medal, or thirty guineas.

To be communicated to the Society on or before the first Tuesday in January, 1811.

68. SUBSTITUTE FOR TAR. To the person, who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of the united kingdom and its colonies; the gold medal, or one hundred guineas. A quantity of the substitute, not less than one hundred weight, with *certificates* that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an *account* of the process, to be delivered to the Society on or before the first Tuesday in March, 1811.

69. TURPENTINE FROM THE SCOTCH FIR, OR PINUS SYLVESTRIS. For the greatest quantity of turpentine, not less than two hundred weight; prepared in Great Britain from that species of fir called the Scotch fir, or *Pinus Sylvestris* Linn.; the gold medal.

Certificates of the turpentine being

prepared from such trees of British growth, together with fifty-six pounds of the turpentine, to be delivered to the Society on or before the second Tuesday in January, 1811.

70. For the next greatest quantity prepared, not less than one hundred weight, on similar conditions; the silver medal.

N. B. The Society being in possession of the method practised for extracting turpentine from the trees whilst growing, and of samples so procured, information will be given upon the subject, on application for that purpose at the Society's house.

71. PREPARATION OF TAN. To the person, who shall prepare in the most concentrated form, so as to be easily portable, and at a price applicable to the purposes of manufacturers, the largest quantity, not less than one hundred weight of the principle called by the French *tannin*, which abounds in oak-bark and many other vegetable substances; the gold medal, or thirty guineas.

Certificates of the superior quality of the quantity so prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1811.

72. INDELIBLE INK. To the person, who shall discover to the Society a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not dearer than that which is now in common use; the silver medal, or fifteen guineas.

Certificates that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above mentioned, with a full detail of the process of making it, and two quarts of the ink to be delivered to the Society on or before the second Tuesday in January, 1811.

73. PREPARATION OF A RED STAIN FOR COTTON CLOTH. To the person, who shall communicate to the Society the cheapest and most effectual method of printing or staining cotton cloths with a red colour, by an immediate applica-

tion of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder; the gold medal, or thirty guineas.

Certificates that the above process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length; one piece of the calico so printed, a quart of the colour in a liquid state, and a full *account* of the preparation and application, to be produced to the Society on or before the second Tuesday in January, 1811.

74. PREPARATION OF A GREEN COLOUR FOR PRINTING COTTON CLOTH. To the person, who shall communicate to the Society the best and cheapest method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld or alumine, and the solutions of indigo by earths or alkaline salts; the gold medal, or thirty guineas.

Certificates and conditions as for premium 73.

75. RENDERING MUSLIN LESS COMBUSTIBLE. To the person, who shall discover to the Society a method of rendering muslin less combustible, to be effected by a cheaper and more effectual mode than any hitherto known; the silver medal.

Specimens of the muslin so prepared, with a full account of the process employed for the purpose, to be produced to the Society on or before the first Tuesday in February, 1811.

N.B. It is expected that the means employed shall neither injure the quality of the muslin, stain it, nor damage any print or dye with which it may be coloured.

76. WHITE SUBSTANCE FOR THE BASIS OF PAINT. To the person, who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of paint, equally proper for the purpose as the white lead now employed; such substitute not to be

of a noxious quality, and to be afforded at a price not materially higher than that of white lead; the gold medal, or one hundred guineas.

A quantity of the substitute, not less than 50lb. weight, with an *account* of the process used in preparing it, and *certificates* that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in January, 1811.

77. RED PIGMENT. To the person, who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use in oil or water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; the gold medal, or thirty guineas.

One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1811.

N.B. It is not required that the colour should resist the action of fire, or chemical applications, but remain unaltered by the common exposure to strong light, damp, and noxious vapours.

78. ULTRAMARINE. To the person, who shall prepare an artificial ultramarine, equal in colour, brilliancy, and durability, to the best prepared from lapis lazuli, and which may be afforded at a cheap rate; the gold medal, or thirty guineas.

The conditions are the same as in the preceding premium for the red pigment.

79. BLUE PIGMENT FROM IRON. To the person, who shall invent, and discover to the Society, the best blue pigment from iron, superior to Antwerp or Prussian blue in colour, and durability, fit for use in oil or water, which may be afforded at a cheap rate; the gold medal, or thirty guineas.

One pound weight of the colour, and a full disclosure of its preparation to be produced to the Society on or before the first Tuesday in February, 1811.

N.B. It appears from the analysis

of lapis lazuli by Klaproth, and the experiments of Guyton (related in the *Annales de Chemie*) that ultramarine is a blue sulphurat of iron, and that a blue substance much resembling it is constantly found amongst the scoræ of blast furnaces where iron is reduced, the Society by offering the above premium wish to call the attention of persons to these facts, and encourage them to make experiments, in the hope of producing a blue pigment, which may be substituted for ultramarine.

80. DESTRUCTIVE EFFECTS FROM MOTHS. To the person, who shall discover to the Society a cheap, easy, and effectual method, verified by repeated and satisfactory trials, of preventing the destructive effects occasioned by moths and other insects, in furs, woollens, and other articles, superior to any hitherto known or practised; the silver medal, or fifteen guineas.

The accounts, with proper certificates, to be produced to the Society on or before the first Tuesday in January, 1811.

81. STATUARY MARBLE. To the person, who shall discover, within Great Britain or Ireland, a quarry of white marble fit for the purposes of statuary, and equal in all respects to those kinds now imported from Italy; the gold medal, or one hundred pounds.

A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and certificates of its possessing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1811.

N. B. In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and express their opinion of its value to the candidate, before the block required by the above premium is produced.

82. PREPARATION OF SULPHURIC ACID, FROM SULPHUR WITHOUT THE USE OF ANY NITRIC SALT. To the person, who shall prepare the largest quantity (not less than one ton) of sulphuric acid

from sulphur without any nitric salt, of a specific gravity not inferior to the best sulphuric acid of commerce; the gold medal, or fifty guineas.

Certificates that not less than the above quantity of such an acid has been prepared, together with a sample, to be produced to the Society on or before the first Tuesday in January, 1811.

83. PREPARATION OF ANY ALKALINE OR EARTHEN NITRATE. To the person, who shall prepare, in Great Britain, the largest quantity, not less than one hundred weight, of any salt of nitric acid, with either earths or alkalis, by a method superior to, and as cheap as those hitherto practised; the gold medal, or one hundred guineas.

Certificates of the above quantity having been prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1811.

84. FINE BAR IRON. To the person, in Great Britain, who shall make the greatest quantity of bar iron, not less than ten tons with coak, from coak pigs, equal in quality to the best imported from Sweden or Russia, and as fit for being converted into steel; the gold medal, or fifty guineas.

Samples, not less than one hundred weight, with certificates that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in January, 1811.

85. PRESERVING IRON FROM RUST. To the person, who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust; the gold medal, or fifty guineas.

A full description of the method of preparing the composition, with certificates that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the first Tuesday in January, 1811.

86. REFINING BLOCK TIN. To the person, who shall discover to the Society the

the best method of purifying or refining block tin, so as to render it fit for the finest purposes to which grain-tin is now applied, and not higher in price; the gold medal, or fifty guineas.

Certificates that not less than three tons have been so refined or purified, with a full detail of the process, and a quantity, not less than one hundred weight, of the tin so refined, to be produced to the Society on or before the first Tuesday in January, 1811.

87. GLAZING EARTHEN-WARE WITHOUT LEAD. To the person, who shall discover to the Society the cheapest, safest, most durable, and most easily fusible composition, fit for the purpose of glazing the ordinary kinds of earthenware, without any preparation of lead, and superior to any hitherto in use; the gold medal, or thirty guineas.

Specimens of the ware so glazed, with proper *certificates* of its having succeeded, and a sample of the materials made use of, to be produced to the Society on or before the first Tuesday in February, 1811.

88. COBALT, ZAFFRE, AND SMALT. For the discovery of a mine of cobalt in Great Britain or Ireland, that will produce a sufficient quantity of the mineral, of good quality, to supply a manufacture of Zaffre or Smalt; the gold medal, or thirty guineas.

Certificates that at least one ton of the ore has been raised; and five pounds of Zaffre, and ten pounds of Smalt made therefrom, to be produced to the Society on or before the last Tuesday in March, 1811.

N. B. It appears from the minutes of the Society, in 1755, that a discovery of cobalt was made at or near Truro in Cornwall, but not a sufficient quantity of ore found to answer the desired purpose.

89. REFINING COPPER FROM THE ORE. To the person, who shall discover to the Society the best method of separating, purifying, and refining copper from the ore, so as to render it fit for the finest purposes to which fine copper is now applied, and by a process superior to any hitherto known or in use, and

not higher in price; the gold medal, or fifty guineas.

Certificates that not less than three tons have been so prepared or refined, and a quantity not less than one hundred weight of the copper so refined to be produced to the Society on or before the first Tuesday in February, 1811.

90. MINERALOGICAL MAP OF ENGLAND AND WALES. To the person, who shall complete and publish an accurate mineralogical map of England and Wales, on a scale of not less than ten miles to an inch, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced; the gold medal, or fifty guineas.

Certificates of the accuracy of such map, together with the map, to be produced to the Society on or before the first Tuesday in February, 1811. The map to remain the property of the Society.

91. MINERALOGICAL MAP OF IRELAND. The same premium is offered for a mineralogical map of Ireland, on similar conditions.

92. MINERALOGICAL MAP OF SCOTLAND. The same premium is offered for a mineralogical map of Scotland, on similar conditions.

93. NATURAL HISTORY. To the author, who shall publish, in the year 1810, the natural history of any county in England, or Wales; the gold medal, or fifty guineas.

It is required that the several natural productions, animal, vegetable, and mineral, peculiar to the county, or found therein, be carefully and specifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. The work to be delivered to the Society on or before the last Tuesday in January, 1811.

PREMIUMS IN POLITE ARTS.

94. HONORARY PREMIUMS FOR DRAW-

INGS BY NOBILITY. For the best original drawing of any kind, by young gentlemen under the age of twenty-one, sons or grandsons of peers, or peeresses in their own right, of Great Britain or Ireland; the honorary medal of the Society in gold.

95. The silver medal for the best copy.

96—97. The same premiums will be given, on the like conditions, to young ladies, daughters or grand-daughters of peers, or peeresses in their own right, of Great Britain or Ireland.

98. **HONORARY PREMIUMS FOR DRAWINGS BY GENTLEMEN.** For the best original drawing of any kind, by young gentlemen under the age of twenty-one; the gold medal.

99. For the best copy, the silver medal.

100—101. The same premiums will be given for drawings by young ladies.

N. B. As the foregoing honorary premiums are intended only for such of the nobility and gentry as may hereafter become patrons or patronesses of the arts; persons professing any branch of the polite arts, or any business dependant on the arts of design, or the sons or daughters of such persons, will not be admitted candidates in the above classes, including 94 to 101.

102. **DRAWINGS OF OUTLINES.** For the best outline, after the plaster cast, of any antique statue, by persons of either sex under the age of twenty-one, the figure not less than eighteen inches; the silver medal.

103. **DRAWINGS BY ENGRAVERS' PUPILS.** For the best finished drawing of the fighting Gladiator, from a cast the size of the original marble, the size of the drawing not less than eighteen inches, by persons under twenty-one years of age; the silver medal.

104. **PERSPECTIVE DRAWINGS OF MACHINES.** For the best perspective drawings of machines, by persons under twenty-one years of age; the silver medal.

105. **DRAWING OF LANDSCAPES.** For the best drawing, in water-colours, of a landscape after nature, not less

than eighteen inches by twelve, by persons of either sex under twenty one years of age; the silver medal.

106. **PREMIUMS FOR DRAWINGS IN GENERAL.** For the best original drawing of any kind, by persons of either sex, under the age of twenty-one; the gold medal.

107. For the best copy, the silver medal.

108. **HISTORICAL DRAWINGS.** For the best historical drawing, being an original composition of three or more human figures, the height of the principal figure not less than eight inches, by persons of either sex under twenty-one years of age; the gold medal.

109. For the next in merit; the silver medal,

110. **ARCHITECTURAL DESIGNS.** For the best original design of a theatre to accommodate with seats three thousand spectators, to consist of plan, elevation, and section; the gold medallion. The drawing to remain the property of the Society.

111. For the next in merit; the silver medallion, on similar conditions.

The following inscription to be engraved on these medallions: *The Premium given by the Society for the Encouragement of Arts, Manufactures, and Commerce, in conformity to the Will of John Stock, of Hampstead, Esq.*

112. **PAINTINGS IN OIL.** For the best painting in oil, of a landscape after nature, the size thirty six by twenty-eight inches; by persons of either sex, under twenty-five years of age; the gold medal.

113. For the next in merit, the silver medal. Each candidate must mention from whence the view was taken.

114. **ETCHING OF AN HISTORICAL PICTURE.** For the best finished etching of an historical picture; the gold medal.

115. **ETCHING OF A LANDSCAPE.** For the best finished etching of a landscape, from a picture; the silver medal.

116. **ENGRAVING OF PORTRAITS.** To the person, who shall complete the best portrait engraved in the line manner; the gold medal.

It is required that two impressions of the engraving be produced, and to remain the property of the Society.

117. For the next in merit; the silver medal, on similar conditions.

118. **LINE ENGRAVINGS OF HISTORICAL SUBJECTS.** For the best historical engraving of any size; the gold medal.

119. For the next in merit; the silver medal.

120. **LINE ENGRAVINGS OF LANDSCAPES.** For the best line engraving of a landscape; the gold medal.

121. For the next in merit; the silver medal.

N. B. It is not necessary, in the classes of line engravings, for the artist's name to be concealed. The first aquafortis proof is required to be sent in with two finished impressions. The aquafortis proof and the two impressions, to remain the property of the Society.

122. **ENGRAVING ON WOOD BLOCKS.** For the best engraving on wood blocks of an historical subject; the size of the principal figure not less than six inches in height, and the block to be at least twelve inches by nine; the gold medal.

Two or more impressions, with the block, to be produced to the Society. The impressions, but not the block, to remain the property of the Society.

123. For the next in merit; the silver medal, on similar conditions.

124. **MEDAL DIE ENGRAVING.** For the best die engraving of one or more heads after the engraver's own model; the gold medal.

125. For the next in merit; the silver medal.

126. For the best die engraving of one figure or a group consisting of not more than three figures, after the engraver's own model; the gold medal.

127. For the next in merit; the silver medal.

The dies, and two impressions or casts, and the model, in each claim for medal die sinking to be produced to the Society. The impressions or casts, but not the model or die, to remain the property of the Society.

128. **BRONZES.** For the best drapery figure or groupe cast in bronze; if a single figure, not less than twelve inches high; and if a group, not less than nine inches; and which will require the least additional labour to repair; the gold medal, or the silver medal and twenty guineas.

The cast to be exhibited to the Society before it is begun to be repaired, with the original figure or group, together with a full explanation of the whole process.

129. **FIXING CHALK DRAWINGS.** To the person, who discovers to the Society an effectual method of fixing black and white chalk drawings without staining, or in any way injuring the drawing; the silver medal, or twenty guineas.

130. **BLACK LEAD PENCILS.** The silver medal or twenty guineas is offered to the person, who shall discover an effectual method of freeing black-lead from impurity, and improving its quality, for the purposes of the arts.

N. B. The object of this premium is to obtain hard or soft pencils, uniformly of a good quality.

CONDITIONS.

FOR THE POLITE ARTS.

All the claims under this class are to be produced to the Society on or before the last Tuesday in February, 1811, and no other articles in the class of Polite Arts to be admitted into the Society with a view to bounties after the last Tuesday in March.

No person, who has gained the first premium in any class, shall be admitted a candidate in a class of inferior age; and no candidate shall receive more than one premium in one year.

No person shall be admitted a candidate in any class, who has already obtained the first premium in that class.

No more than one performance in any class shall be received from the same candidate.

All performances (to which premiums or bounties are adjudged) shall remain with the Society until the first Wednesday in June, 1811, when they will be re-delivered, unless mentioned in the premiums to the contrary.

No performance shall be admitted, that has obtained a premium, reward, or gratification, from any other society, or academy, or been offered for that purpose.

All performances, that obtain premiums in the Polite Arts, must have been begun after the publication of such premiums, except line engravings.

It is required, that the matters, for which premiums are offered, be delivered in without names, or any intimation to whom they belong; that each particular thing be marked in what manner each claimant thinks fit, such claimant sending with it a paper sealed up, having on the outside a corresponding mark, and on the inside the claimant's name, residence, and age; which paper is not to be opened unless the candidate be successful, or by a special vote of the Society.

To encourage real merit; and prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate, to be made under the inspection of the Committee of Polite Arts, in every instance where such proof may appear necessary.

All candidates in the Polite Arts are required to signify, on their drawings, whether the performances are originals or copies; and to mark thereon the class, for which each is intended, and, if possible, to send the original from whence the copies were taken,

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

131. EMPLOYMENT OF FEMALES. To the person, who shall instruct and employ the greatest number of females,

not fewer than twenty, in the making of men's cloaths, particularly of woollen cloth, and not being for the use of the army or navy; the gold medal, or fifty guineas.

Certificates that the number of women above mentioned have been constantly so employed for at least three months, to be produced to the Society, on or before the last Tuesday in March, 1811.

132. For the next greatest number of women so employed, not fewer than ten; the silver medal, or fifteen guineas, on similar conditions.

133. CLOTH FROM HOP-STALKS, &c. To the person, who shall produce to the Society the greatest quantity, not less than thirty yards of cloth, at least 27 inches wide, made in Great Britain or Ireland, of hop-stalks or bines, or other raw vegetable substances, the produce of Great Britain or Ireland, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as cloth of equal quality and appearance now made from hemp, flax, or cotton, and much finer in quality than any hitherto manufactured in England from hop-stalks, &c.; the gold medal, or thirty guineas.

One pound of the thread, of which the cloth is made, and thirty yards of the cloth, together with proper *certificates* that the whole is manufactured from hop-stalks or bines, &c. to be produced to the Society on or before the first Tuesday in December, 1810.

N. B. The Society is already in the possession of cloth made in England from hop-stalks or bines, which may be inspected by application to the housekeeper.

134. SHEEP'S WOOL. To the person, who shall prove to the Society that he has sold the largest quantity of Merino wool, or such wool as will answer the same purposes, being the produce of his own flock, for the purpose of being manufactured into superfine cloth, the quantity of wool not less than five hundred weight, in the year 1810; the gold medal.

Certificates, along with samples of

the wool and of cloth manufactured from it, to be produced to the Society on or before the last Tuesday in March, 1811.

135. For the next greatest quantity, not less than two hundred and fifty pounds; the silver medal, on similar conditions.

136. HOG'S BRISTLES. To the person, who shall prepare the greatest quantity of bristles, from swine bred in the united kingdom, equal in quality to those imported from Russia or Prussia, and at as cheap a rate; the silver medal, or fifteen guineas.

Certificates, that not less than one hundred weight have been so prepared, and a sample of not less than fourteen pounds of such bristles, to be produced to the Society on or before the last Tuesday in February, 1811.

137. WICKS FOR CANDLES OR LAMPS. To the person, who shall discover to the Society a method of manufacturing hop-stalks or bines, or any other cheap material the growth of Great Britain, so as to render them equally fit for the purpose of supplying the place of cotton, for wicks of candles or lamps; the silver medal, or twenty guineas.

Samples, not less than five pounds weight, of the wick so prepared, to be produced to the Society on or before the last Tuesday in December, 1810, with *certificates* that the whole quantity is equal in quality to the sample.

138. EXPERIMENTS TO ASCERTAIN THE PROPER THICKNESS OF WICKS FOR CANDLES. To the person, who shall make known to the Society the most satisfactory result of a series of experiments, actually made by him to determine the best thickness of cotton wicks for candles, so as to obviate the defects of those commonly used; the silver medal, or ten guineas.

Certificates, that not less than one hundred weight have been so made, and six pounds of the candles, to be produced to the Society on or before the last Tuesday in February, 1811.

N. B. The intention in offering this premium, is to ascertain the proper

thickness or bulk of the wick in proportion to that of the tallow, and to remove the unpleasant consequences and waste arising from the sparkling, or guttering of the candles in common use.

139. PAPER FROM RAW VEGETABLE SUBSTANCES. To the person who shall, between the first of January, 1810, and the first of January, 1811, make the greatest quantity, and of the best quality, (not less than ten reams) of good and useful paper, from raw vegetable substances, the produce of Great Britain or Ireland, of which one hundred weight has not been used in manufacturing paper, previous to January, 1809, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as paper of equal quality and appearance now made from rags; the silver medal, or twenty guineas.

N. B. The object of the Society being to add to the number and quantity of raw materials used in this manufacture, it is their wish to include every useful sort of paper, and to introduce such natural products as can be easily and cheaply procured in great quantities. The Society are in possession of two volumes containing a great variety of specimens of paper made from raw vegetable substances, viz. nettles, potatoe-haulm, poplar, hop-bines, &c. which volumes may be inspected by any person on application to the house-keeper.

Certificates of the making such paper, and one ream of the paper, to be produced on or before the second Tuesday in January, 1811.

140. TRANSPARENT PAPER. To the person, who shall discover to the Society a method of making paper from the pulp, that shall be perfectly transparent, and of a substance and body equal to foolscap, that shall take and bear common writing ink, with the same facility and correctness as writing-paper generally in use; the silver medal, or twenty guineas.

Certificates of the making such paper, an account of the process, and one

ream of the paper, to be produced on or before the second Tuesday in January, 1811.

141. CHINTZ PATTERNS FOR CALICO-PRINTERS. For the best original pattern, in a new taste, of light and dark-ground chintz for garment-work, or furniture, fit for the purposes of calico printers, by persons of either sex; the silver medal. The pattern, for which the premium is adjudged, to remain the property of the Society.

142. COPPER-PLATE PATTERNS FOR CALICO-PRINTERS. For the best pattern, in a new style, fit for the purposes of calico-printers for garment work, or furniture; the silver medal. The pattern, for which the premium is adjudged, to remain the property of the Society.

N. B. The patterns to be produced on or before the last Tuesday in February, 1811.

143. MANUFACTURE OF SAIL CLOTH. To the person, who shall produce to the Society a whole piece of sail cloth, of his own manufacture, proper for the general use of the Royal Navy, and equal to the best Dutch; the gold medal.

Certificates of its being manufactured by the person sending it, and a particular detail of the several circumstances attending its manufacture through the different stages thereof, to be sent to the Society on or before the last Tuesday in March, 1811.

144. For the next best in merit, on similar conditions, the silver medal.

145. GLOVES EQUAL TO FRENCH KID. To the person, who shall make known to the Society a process equal to that of the French, or a superior one, for preparing, dyeing, and finishing the skins, of which their gloves are made, verified by actual experiments, and the communication accompanied with at least a dozen pair of gloves made from skins so prepared in an equal or superior manner; the gold medal, or thirty guineas.

Certificates from competent persons fully approving of the result of such experiments, together with the gloves

and communication to be produced to the Society on or before the last Tuesday in March, 1811.

PREMIUMS IN MECHANICS.

146. GUNPOWDER MILLS. To the person who, in the year 1810, shall invent and bring to perfection the most effectual method of so conducting the works of gunpowder mills, in the business of making gunpowder, as to prevent explosion; the gold medal, or one hundred guineas.

Certificates and *accounts* of the method having been put in practice in one or more gunpowder mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1811.

N. B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder making, which fall short of the total prevention of explosion, and they are sent to the Society for the sake of humanity, the papers so sent in will receive due consideration, and such bounty or reward will be bestowed as they may appear to merit.

147. TRANSIT INSTRUMENT. To the person, who shall invent and produce to the Society a cheap and portable transit-instrument, which may easily be converted into a zenith-sector, capable of being accurately and expeditiously adjusted for the purpose of finding the latitudes and longitudes of places, and superior to any portable transit-instrument now in use; the gold medal, or forty-guineas.

To be produced on or before the last Tuesday in January, 1811.

148. TAKING WHALES BY THE GUN-HARPOON. To the person who, in the year 1810, shall strike the greatest number of whales, not fewer than

three, with the gun-harpoon; ten guineas.

Certificates of the striking such whales, and that they were actually taken in the year 1810, signed by the master, or by the mate, when the claim is made by the master, to be produced to the Society on or before the last Tuesday in December, 1810.

This premium is extended one year further, on similar conditions.

149. FAMILY MILL. To the person, who shall invent and produce to the Society the best constructed mill for grinding corn for the use of private families, or parish poor; the construction to be such as to render the working of the mill easy and expeditious, and superior to any hitherto in use; the gold medal, or thirty guineas.

The mill, and *certificates* of its having been used to good effect, to be produced to the Society on or before the first Tuesday in February, 1811. Cheapness and simplicity will be considered as essential parts of its merit: and the mill, or a model, to remain with the Society.

150. MACHINE FOR RAISING COALS, ORE, &c. &c. To the person, who shall invent a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use; and which shall produce the effect at a less expense than those already known, or in use; the gold medal, or fifty guineas.

A model of the machine, made on a scale of not less than one inch to a foot, with a *certificate* that a machine at large on the same construction has been advantageously used, to be produced to the Society on or before the second Tuesday in February, 1811.

151. IMPROVED WALKING WHEEL, OR CRANE. To the person, who shall invent an improved walking-wheel or crane, on which the weight and power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less weight to be raised or lowered; the gold medal, or thirty guineas.

The model, on a scale of not less than one inch to a foot, with a proper *certificate* that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in February, 1811.

152. MACHINE FOR RAISING WATER. To the person, who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known or in use for raising water out of wells, &c. from a depth of not less than fifty feet; the gold medal, or thirty guineas.

Certificates of the performance of the machine, and a model of it, on a scale of not less than one inch to a foot, to be produced to the Society on or before the first Tuesday in February, 1811.

153. ELM PIPES. To the person, who shall invent and discover to the Society a substitute for the elm pipes now in common use for the conveyance of water, which shall be cheaper, equally effectual, and more durable than any heretofore employed; the gold medal, or fifty guineas.

It is required that one of the pipes so employed, an accurate *account* of the method used, and every expense attending it, together with satisfactory accounts of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1811.

154. LAYING WOODEN PIPES. To the person, who shall invent and discover to the Society a superior method of laying or connecting the wooden pipes now in use for conveying water, so as to lessen the injury they receive thereby; the silver medal, or twenty guineas.

It is required that a model, an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1811.

155. EXTINGUISHING FIRES. To the person, who shall produce to the Society the best and most effectual method of procuring an immediate supply of water in case of fire, or for the means

best calculated to prevent or extinguish accidental fires in buildings, superior to any now in use; the gold medal, or thirty guineas.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the second Tuesday in January, 1811.

156. BORING AND BLASTING ROCKS. To the person, who shall discover to the Society a more simple, safe, cheap, and expeditious method than any hitherto known or in use, of boring or blasting rocks in mines, shafts, wells, &c. the gold medal, or thirty guineas.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in January, 1811.

157. HEATING ROOMS FOR THE PURPOSE OF MANUFACTURERS. To the person, who shall invent and discover to the Society a method of heating rooms superior to any hitherto known or in use, and at a moderate expense, for the purpose of painters, japanners, and other manufacturers, so as to avoid the necessity of iron or copper tunnels going through the rooms to convey the smoke, whereby the danger from such tunnels may be prevented; the gold medal, or forty guineas.

A model, or complete drawing and description of the method, with *certificates* that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1811.

158. IMPROVED VENTILATION. To the person, who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used; the gold medal, or fifty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates*, to be delivered to the Society on or before the last Tuesday in February, 1811.

159. PREVENTING ACCIDENTS FROM HORSES FALLING WITH TWO-WHEELED CARRIAGES. To the person, who shall invent, and produce to the Society a method, superior to any hitherto known or in use, to prevent accidents from the falling of horses with two-wheeled carriages, especially on steep declivities; the silver medal, or fifteen guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates* that the same has been used with success, to be delivered to the Society on or before the second Tuesday in January, 1811.

160. IMPROVING TURNPIKE AND OTHER ROADS. To the person, who shall discover to the Society the most effectual and cheapest method, verified by actual experiments, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat or any other mode, so as to form an even, hard, and durable carriage road; the gold medal, or thirty guineas.

It is required that an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1811.

161. RAISING THE BODIES OF PERSONS WHO HAVE SUNK UNDER WATER. To the person, who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water; the gold medal, or thirty guineas.

The drag or machine, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in March, 1811.

162. FOR PREVENTING PREJUDICIAL EFFECTS TO THE PERSONS EMPLOYED IN

POINTING NEEDLES. To the person, who shall invent and produce to the Society a mode of obviating the prejudicial effects, that attend the operation of pointing needles, by grinding them dry, during which the particles of grindstone, dust, and steel, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders; the gold medal, or thirty guineas.

A model of the apparatus, and a full account of the means by which the effect has been produced, together with proper *certificates* of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1811.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE.

163. TAKING PORPOISES. To the people in any boat or vessel, who, in the year 1810, shall take the greatest number of porpoises on the coast of Great Britain or Ireland, by gun, harpoon, or any other method, not fewer than thirty, for the purpose of extracting oil from them; the gold medal, or thirty pounds.

Certificates of the number, signed by the persons, to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in January, 1811.

164. OIL FROM PORPOISES. To the person, who shall manufacture the greatest quantity of oil from porpoises taken on the coast of Great Britain or Ireland, in the year 1809, not less than twenty tons; the gold medal, or thirty pounds.

Certificates of the oil having been made from porpoises actually caught on the coast of Great Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1811.

165. CURING HERRINGS. To the person or persons who shall, before January, 1811, cure the greatest quantity of white herrings, not less than thirty barrels, equal in all respects to the best Dutch herrings, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port; the gold medal, or fifty guineas.

166. For the next greatest quantity, not less than fifteen barrels; the silver medal, or twenty guineas.

A sixteen gallon barrel of the herrings to be produced to the Society on or before the first Tuesday in February, 1811, with *certificates* that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimen, together with a full description of the process employed.

N. B. The Society have extended the premiums, No. 163 to 166, one year further, on similar conditions.

GENERAL CONDITIONS.

As the great object of the Society in rewarding individuals is to draw forth and give currency to those inventions and improvements, which are likely to benefit the public at large, candidates are requested to observe, that, if the *means*, by which the respective objects are effected, do require an expense or trouble too great for *general purposes*, the Society will not consider itself as bound to give

the offered reward; but though it thus reserves the power of giving in all cases such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims.

All candidates are to take notice, that no claim for a premium will be attended to, unless the conditions of the advertisement are fully complied with.

All models of machines, which obtain premiums or bounties, shall be the property of the Society; and where a premium or bounty is given for any machine, a perfect model and description thereof shall be given to the Society.

All the premiums of this Society are designed for Great Britain and Ireland, unless expressly mentioned to the contrary.

The claims shall be determined as soon as possible after the delivery of the specimens.

No person shall receive any premium, bounty, or encouragement from the Society, for any matter for which he has obtained, or purposes to obtain a patent, or for which he has obtained, or expects any premium or reward from any other Society.

A candidate for a premium, or a person applying for a bounty, being detected in any disingenuous method to impose on the Society, shall forfeit such bounty, and be deemed incapable of obtaining any for the future.

No member of this Society shall be a candidate for, or entitled to receive, any premium, bounty, or reward whatsoever, except the honorary medal of the Society. The candidates are, in all cases, expected to furnish a particular account of the subject of their claims; and where certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the respective advertisements, and be signed by persons, who have a positive knowledge of the facts stated.

Where premiums or bounties are obtained in consequence of specimens produced, the Society mean to retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No candidate, not a member, shall be present at any meetings of the Society or Committees, or admitted at the Society's rooms, after they have delivered in their claims, until such claims are adjudged, unless summoned by the committee.

The Society, anxious to promote the Arts of their country, have adopted the resolution of forming a Collection of Prints, to be open for public inspection; and, having arranged those already in their possession, invite engravers to send etched or finished proofs of their plates: and hope that amateurs, collectors, and publishers of works of art, will also contribute to the undertaking.

Prints of machines, or maps, will also come within the above arrangement.

The Society farther invite the communications of scientific and practical men, upon all subjects connected with the views of the Society, although their experiments may have been conducted upon a smaller scale than the terms required by the premiums; as such communications may afford ground for more extensive application, and thus materially contribute to the advantage of the public.

The Library of the Society, which has already become very valuable, may yet receive considerable additions and improvements from the presents of the members, or other persons who may be inclined to place useful books or valuable manuscripts in a repository, at once permanent and conducive to the national benefit.

All communications are to be made by letter, addressed to CHARLES TAYLOR, M. D. the Secretary, at the Society of Arts, &c, Adelphi, London.

And where articles are sent by sea for the Society, the Bills of Lading are to be addressed to the care of WILLIAM VAUGHAN, Esq. Mincing-lane, London, who has politely undertaken to receive them for the Society.

The Winchester bushel is the measure referred to for grain; and as the acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute acres of five and a half yards to the rod or pole, when acres are mentioned in their list of premiums; and they request that all communications to them may be made agreeably thereto.

The Society desire that the Papers on different subjects sent to them may be full, clear, explicit, fit for publication, and rather in the form of Essays than of Letters: and that descriptive drawings may be sent, with the models and machines laid before the Society.

* * * To the persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose.

Item. I give and bequeath to A. B. and C. D. the sum of
upon condition and to the intent that they, or one of them, do pay the same to the Collector, for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures, and Commerce; which said sum of I will and desire may be paid out of my personal estate, and applied towards carrying on the laudable designs of the Society.

N. B. The Society considering, that it would be beneficial to the commerce of the United Kingdom to bring the British marbles into more general use, and that the most effectual method of accomplishing their object would be, for the present, to make them more generally known in the capital, have come to the following resolutions:

Resolved,—That specimens of British marbles be exposed in the Society's rooms, at the Adelphi, for the inspection of the public, under the following regulations;

1st. That all the specimens be exact to a given size, viz. eight inches high, six inches broad, one inch thick, and polished on one face.

2d. That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name of the parish where situated, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

Resolved,—That as the exertions of the Society can be beneficial to the public, only inasmuch as their views are seconded by the public, the Society request, that all persons proprietors of marble quarries will favour them with a specimen of the marble, worked to the exact size abovementioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public. By such arrangements, it is expected that the interest of the proprietors of the quarries will be promoted, and the use of British marble much extended. A variety are already exhibited in the Society's Great Room.

The Society take this opportunity of returning their thanks to the several Societies and Individuals, who have favoured them with presents for their Repository and Library.

Premiums and Rewards bestowed in May, 1810, by the Society of Arts, Manufactures, and Commerce, Adelphi.

ON Tuesday the 29th of May, 1810, the Rewards of the Society were, as usual, distributed by his Grace the Duke of Norfolk, arranged under the following classes; and on Wednesday, the 6th of June, the Society held the last Meeting of that Session, and adjourned to the fourth Wednesday in October next.

IN AGRICULTURE.

To T. Johnes, Esq. M. P. Hafod, Cardiganshire, for planting 300,000 larch trees, 30,000 beech, and 10,000 spruce firs, class 10; the gold medal.

To J. C. Curwen, Esq. M. P. Workington Hall, Cumberland, for experiments on stall feeding of cattle, class 54; the gold medal.

To J. Stockdale, Esq. of Cark, Lancashire, and R. Towers, Esq. of Duden Grove, in Cumberland, for gaining 564 acres of land from the sea at Windermere in Lancashire, class 34; the gold medal.

To I. Berney Petre, Esq. Westwick House, Norfolk, for extensive plantations of pinaster fir trees, the silver medal.

To E. Smith, Esq. of Brentwood, Essex, for preparing from the fibres of the common nettle, thread, and articles resembling flax, hemp, tow, and cotton, the silver medal.

To Mr. T. Balls, Saxlingham, near Holt, Norfolk, for a screw adjusting plough, the silver medal.

To Mr. W. Jeffery, Cotton End, Northampton, for a pair of expanding harrows, applicable both for clearing foul land, and harrowing in seeds, the silver medal.

To Mr. J. Hutton, Jun. Ridgway, near Sheffield, for an improved reaping hook, the silver medal.

To Mr. J. Baker, West Coker, near Yeovil, Somersetshire, for an improved implement for destroying docks and thistles, the silver medal.

IN CHEMISTRY.

To Mr. I. Jopling, Gateshead, Durham, for searching out, and working quarries of British marble, the gold medal.

To H. B. Way, Esq. of Bridport Harbour, Dorsetshire, for his method of extracting turpentine from firs of English growth, the silver medal.

To Mr. B. Cooke, of Birmingham, for his method of producing heat, light, and various useful articles from pit coal, the silver medal.

IN POLITE ARTS.

To Miss J. Steele, Westminster, for an original landscape of the houses called the Five Chimnies, in Tothill fields, class 101; the silver medal.

To Miss R. Drummond, Church Street, Soho, for an original portrait in crayons, the silver medal.

To Miss J. Watts, Prince's Place, Kennington, for painting and gilding on China, the lesser silver pallet.

To Miss E. Phillips, Wandsworth Road, for an oil painting, a view of New Shoreham, the greater silver pallet.

To H. Parke, Esq. Dean Street, Soho, for an oil painting of a Dutch smack going off in a gale, the silver medal.

To Mr. H. D. Thielcke, Queen's house, for an oil painting of the holy family, the greater silver pallet.

To Mr. J. Roberts, Broad Street,

Golden Square, for an outline of the Laocoon and sons, class 98; the silver medal.

To Mr. E. Finden, John Street, Fitzroy Square, for an outline of the Laocoon, the smaller silver pallet.

To Mr. I. Brewster, Winchester Place, Pentonville, for a pen and ink drawing, the greater silver pallet.

To Mr. R. A. Freebain, Kepple Row, Fitzroy Square, for a drawing of St. Paul preaching, the small silver pallet.

To Mr. C. Eastlake, Broad Street, Carnaby Market, for a drawing of Cupid and Psyche, class 95; the silver medal.

To Mr. D. Dighton, Charing Cross, for an original drawing of the defeat of King Porus by Alexander the Great, on the banks of the Hydaspes, the greater silver pallet.

To Master W. C. Ross, No. 61, Stanhope Street, Clare market, for an original drawing of Caractacus, the British king, before Claudius Cæsar at Rome, the silver medal and twenty guineas.

To Master J. Farey, Upper Crown-street, Westminster, for an original perspective drawing of London-bridge water works, the greater silver pallet.

To Master L. Landseer, Queen Ann-street East, for an etching of sheep and goats, the smaller silver pallet.

To Master I. C. Bromley, Brook-green, Hammersmith, for an original etching of a stag hunt, the silver medal.

To Mr. J. Hassel, Clement's-inn, for an ingenious improvement in the aqua-tinta process, by which pen, pencil, and chalk drawings can be easily imitated, the silver medal and thirty guineas.

To Mr. A. Wilson, Duke-street, Lincoln's Inn-fields, for skill and exertions in Steryotype printing, the gold medal.

To Mr. T. Allason, Bentinck-street, Manchester Square, for an original design of an academy of arts, class 117; the gold medallion, being the premium given by this Society, in conformity to

the will of the late John Stock, Esq. of Hampstead.

To Mr. G. Phillips, Wandsworth-road, for an original design of an academy of arts, the silver medallion, pursuant to the said will.

To Mr. R. Cathery, No. 14, Meadows-row, Westminster-road, near the Asylum, Lambeth, for a preparation of ox-gall for painters' and for other uses, ten guineas.

To Master S. Sutton, Upper Norton-street, Marylebone, for a plaster figure of the Gladiator, the smaller silver pallet.

To Mr. T. Wyon, Jun. John-street Black-friars, for a medal die engraving of a beautiful head of Isis, the patroness of the arts, the gold medal.

MANUFACTURES.

To Mr. J. Locket, Donnington, near Newbury, for weaving damask napkins, equal to foreign, the silver medal.

To Mr. I. Sholl, Elder-street, Norton-falgate, for an improvement in machinery for weaving figured silks, fifteen guineas.

IN MECHANICS.

To H. P. Lee, Esq. of Maidenhead-thicket, for an improved thrashing machine, class 43; the gold medal.

To Mr. I. Allan, Blewitt's-buildings, Fetter-lane, for his improvements in a mathematical dividing engine, the gold medal.

To Mr. Bryan Donkin, Fort-place, Bermondsey, for a tachometer, or, an instrument to ascertain the velocities of machinery, the gold medal.

To the Rev. J. Bremner, Walls, Orkney Islands, for a method of making any ship's boat a life-boat, to preserve the lives of the crew in imminent danger, the silver medal and twenty guineas.

To Mr. S. Hemman, Chatham-dock yard, for an improved mooring-block for ships, the silver medal.

To Mr. I. Davis, No. 7, John-street,

Spitalfields, for a method of assisting persons to escape from houses on fire, fifty guineas.

To Mr. G. Marshall, No. 15, Cecil-street, St. Martin's lane, for constructing sash windows, so as to be cleaned and repaired within the house, fifteen guineas.

To Mr. B. Smith, No. 11, Turnham place, Curtain road, Shoreditch, for a method of raising a loaded cart, when a horse in the shafts has fallen with it, fifteen guineas.

To Mr. I. Taylor, Holwell, Tavistock, for a method of ventilating mines, or hospitals, by extracting the foul air, the silver medal.

To Mr. W. Moulton, No. 37, Bedford-square, for his method of using the filtering stone, for purifying water, the silver medal.

To Mr. A. Reid, Green's end, Woolwich, for a compensation pendulum, fifteen guineas.

To Mr. G. Spark, Elgin, for a method of knowing the hour in the dark by a common watch, the silver medal.

To Mr. E. Baker, Whitechapel-road, for a method of rendering pistols more safe to the bearer, and more effectual in use, the silver medal.

To Mr. C. Williams, Cane-place, Gravel-lane, for a method of boring the conical part of brass cocks, twenty guineas.

To Mr. L. Aubrey, Fort-place, Bermondsey, for instruments for equalizing the width and thickness of leather straps, thirty guineas.

To Mr. I. D. Ross, No. 55, Princes-street, for a machine for separating iron filings from their mixture with other metals, five guineas.

To Mr. I. Whitford, St. Bartholomew's-hospital, for an elastic truss for ruptures, the silver medal.

To Mr. G. Pringle, Church-street, Soho, for constructing spring crutches for invalids, the silver medal.

To Mr. I. Morrison, No. 145, Holborn, near Brook-street, for inventing implements, by which persons, who have had the misfortune to lose their hands, may usefully assist themselves, the silver medal and forty guineas.

DIARY OF THE WEATHER,

AT THE

BOTANIC GARDEN

OF THE

DUBLIN SOCIETY,

FOR THE YEARS 1806, 1807, 1808.

BY

J. UNDERWOOD, A. L. S.

HEAD GARDENER AND SUPERINTENDANT.

Dublin :

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1809.

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DIARY OF THE WEATHER.

Ther. Thermometer, is noted at noon, and four o'clock, and occasionally at other times. *Bar.* Barometer.

JANUARY, 1806.

Day.	Ther.	Bar.	Wind.	
1	42 39	29.1 30	W. High.	{ Mild this morning, with sunshine at times this day, and wind pretty high; fine moonlight at night.
2	38 36	29.8	W. Little.	{ Clear and sharp this morning till ten; some sunshine afterwards; fine moonlight at night.
3	41 39	29.7	W. Sharp	{ Cloudy and a little sunshine at nine this morning; wind sharp, and cloudy all day afterwards; fine moonlight at night.
4	50 45	29.7	W. High.	{ Cloudy this morning, and wind high; stormy with some rain at eleven; clear moonlight at night.
5	44 45	29.8	W. Sharp	{ Cloudy this morning, and mild till nine; rain most of the day afterwards; rain at night.

JANUARY.

Day.	Ther.	Bar.	Wind.	
6	47 46	29.8	W. Sharp.	{ Cloudy and rain most of this day; some small rain at night.
7	51 47	29.4	W. Very high.	{ Fine mild morning till ten; high wind and very stormy, with dashing rain all day afterwards; fine moonlight at night.
8	42 36	29.4	W. High.	{ Wind high this morning, with rain at times, most of the day; fine moon light at night.
9	37 36	29.2	W. Little.	{ Cloudy and calm this morning, with very little sunshine at twelve; wind very high; dark, with rain at night.
10	35 36	28.8	N.W. High.	{ Wind high and sharp this morning; Dublin mountains white with snow, snow and hail most of the day; fine moon light at night.
11	40 39	29.1	N.W. Little.	{ Cloudy and mild, with rain at times, most of the day; dark, with rain at night.
12	35 34 8 m. 28	29	W. Sharp.	{ Cloudy most of this day; a little sunshine at eleven; clear and sharp at night.
13	35 34	29	W. Little.	{ Sharp frost this morning; fine clear sunshine all day; dark at night.
14	41 39	29.3	W. High.	{ Fine mild morning, and wind high, with sunshine at times this day; stars this night at six; rain at seven.
15	40 41	39.4	S.W. High.	{ Cloudy and stormy this morning, with sunshine at nine, and at times all day; afterwards dark and rain at night.
16	37 38	29.3 29.4	W Little.	{ Rain in the night; cloudy with rain and snow most of the day; stormy, with rain at night.

JANUARY.

5

Day.	Ther.	Bar.	Wind.	
17	40 37	29.6	W. High.	{ Dashing rain and wind high till one; mild, with rain afterwards; dark, with rain at night.
18	41 39	29.4	W. Little.	{ Mild and cloudy this day, with a little sunshine at nine; mild and dark at night.
19	45 42	29.7	W. Little.	{ Cloudy and mild this morning, with some rain at twelve; wind sharp, afternoon mild and very dark, with rain at night.
20	52 52	29.4 29.5	W. Very High.	{ Stormy and wind high this morning, with dashing rain all day; dark at night.
21	45 44	29.7	E.S. E. Stormy.	{ Mild this morning, with small rain all day; rain this night till seven; fine after.
22	46 45	29.8	S.E. N.W. Little.	{ Mild this morning, with sunshine till one; rain from four till six; fine after.
23	44 45	29.7	W. Little.	{ Fine and clear, with sunshine at times; wind high in the afternoon; rain in the night.
24	45 40	29.5	W. High.	{ Fine mild morning, till nine; fine sunshine till twelve; heavy dashing rain for about twenty minutes; sunshine at one; heavy shower at five; fine moonlight at night.
25	39 38	29.7 29.4	W. Little.	{ Fine clear morning, with sunshine most of the day; clear moon-light at night.
26	38 38	20.3 29.6	W. Little.	{ Clear morning, with sunshine till ten; cloudy; no sun after; sharp frost, and clear moonlight at night.
27	36 35	29.6	E. Little.	{ Cloudy this morning; some hail showers in the forenoon; rain and sleet afterwards; dashing rain at times in the night; wind high.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
28	39 36	29.7	E. Little.	{ Some hail showers and the ground white with snow; a heavy shower of hail at eleven; a little sun at twelve; some showers of hail and sleet in the afternoon; fine moon-light, at night.
28	34 31	29.7	E. Little.	
12. n.	23			
7. m.	21			{ Sharp this morning; ground white with snow: clear, with sunshine all day afterwards; sharp frost, with moon-light at night.
30	35 32	29.5	N. Little.	
12. n.	25			
7. m.	19			{ Sharp frost this morning; ground white with snow; fine clear sunshine all day; sharp frost this night, with heavy snow from dusk till ten this night.
31	32 30	29.5	N. Little.	
12. n.	27			

Rain Gauge 2 inches 15 parts.

FEBRUARY, 1806.

Day.	Ther.	Bar.	Wind.	
7. m.	21			{ Sharp frost this morning, with sunshine most of the day; sharp frost this night, with fine moon-light.
1	32	29.6	N.	
	27	29.8	Little.	
12. n.	17			
7. m.	13			{ Very sharp frost this morning; some sunshine at times; a hea- vy shower of snow at twelve, ground white; clear and sharp frost; light at night, with some snow.
2	30	29.8	N. W.	
	27	30	Little.	
7. m.	32			{ Cloudy, with a high wind this morning; wind sharp and dust flying all day; clear and sharp at night.
3	35	29.7	E.	
	34		High.	
4	47	29.6	W.	{ Cloudy all this day, with showers at times, most part of the day clear; and wind high at night.
	43		High.	
5	47	29.5	S.	{ Cloudy and very mild all this day; fine and mild at night, with some rain.
	43	29.6	Little.	
6	44	29.6	S. W.	{ Little frost this morning, and cloudy; sunshine at times; most of this day with a high wind; dark this night, with heavy rain at nine.
	41		Stormy.	
7	48	29.4	W.	{ Fine mild morning, and fine sun- shine most of the day; some rain, and dark at night.
	44	29.5	Stormy.	
8	48	29.6	W.	{ Mild morning, with sunshine; at nine fine sunshine till ele- ven; cloudy afterwards; mild at night.
	45	29.7	Little.	

<i>Days.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	48 40	29.6	W. Little.	{ Mild this morning, with sunshine at nine; a sharp; shower of rain at two; a shower at four; dark at night.
10	46 43	29.5 29.7	W. Little.	{ Cloudy, and mild this morning; cloudy, with some rain in the afternoon; dark and mild at night.
11	46 44	20	W. Little.	{ Sharp this morning, with sunshine at nine; fine sunshine at times in the forenoon; cloudy afternoon; clear at night.
12	37 34	29.8 29.7	W. High	{ Wind high this morning, with a little sunshine at times most of the day; heavy rain at five, with two fine rainbows; sharp at night.
13	46 44	29.6	W. N. W. High.	{ Cloudy, with some sunshine at nine; wind high, with rain at times; fine in the afternoon; dark at night.
14	45 43	29.7 28.6	W. N. W. Moderate.	{ Cloudy, with some sunshine at nine, and at times till one; dashing rain in the afternoon; rain at seven this night; fine at twelve.
15	44 42	29.5 29.6	W. Mod.	{ Mild this morning, with sunshine at times most of the day; clear at night.
16	47 42	29.6 30.1	N. W. Little.	{ Cloudy and mild this morning; thick small rain most of the day afterwards; clear at night.
17	44 40	30.3 30.4	W. Very High.	{ Fine clear morning, with sunshine at nine; fine sunshine all day; clear at night.
18	44 41	30.5	S. S. W. Little.	{ Sharp frost this morning, with sunshine all day and fog, with rain and frost at night.

FEBRUARY.

Days.	Ther.	Bar.	Wind.	
19	42 41	30.5 30.4	S. Little.	{ White frost this morning; fine clear sunshine till one; cloudy afterwards; some rain this night.
20	35 37	30 28.8	S.W. Little.	{ Rain and snow this morning; heavy rain at times; snow and sleet; afternoon dark, with rain at night.
21	44 40	29.7	W. High.	{ Rain in the night, some at eight; cloudy, with rain at times, most of the day; stormy this night, and wind high, with rain.
22	44 42	29.5 29.6	S.E. N.W. Little.	{ Cloudy this morning, with sunshine at nine; very mild, with sunshine at times; most of the day; fine moonlight at night.
23	54 51	29.7 30.1	S.E. N.W. Little.	{ Cloudy and mild this morning; ther. 52 at seven; fine sunshine in the forenoon; rain at two; fine moonlight at night.
24	41 40	30.2	S.W. Little.	{ Cloudy and mild this morning; sunshine at nine; fine sunshine most of the day afterwards; fine moonlight at night.
25	50 50	30.2 30.1	W. Pretty high.	{ Fine clear morning; mild, with small rain at eleven; clear sunshine afternoon; fine moonlight at night.
26	44 41	30	N.N. W. Very high.	{ Fine clear morning; some sunshine at times in the forenoon; very stormy, with rain at three; fine moonlight at night.
27	49 48	30.1 30.2	N.N. W. Little.	{ Fine mild cloudy morning, with sun at eight; a little sun at times, most of the day; fine clear night.

Days. Ther. Bar. Wind.

28	45	30.5	W.
	44	30.4	Little.

Mild and fine sunshine this morning, which continued till noon; showers of rain in the afternoon; clear at times; showers in the night.

Rain Gauge. 1 inch 12 parts.

MARCH, 1865.

Day.	Ther.	Bar.	Wind.	
1	48 46	30.5	S.E. N.W. Very high.	{ Cloudy and mild this morning; stormy after ten; some sunshine and rain at times; wind very high; pretty calm at four, with sunshine; fine night.
2	52 50	30.5	N.W. High.	{ Fine clear morning, with sunshine at nine; fine sunshine most of the day afterwards; fine clear night.
3	53 52	30.6	N.W. High.	{ Mild and cloudy this morning, with a little sun at nine; cloudy and stormy this forenoon; some sunshine in the afternoon; fine night.
4	50 48	30.6	W. Little.	{ Very fine mild morning, with fine sunshine at eight, which continued most of the day; fine clear night.
5	48 47	30.6	W. Little.	{ A very fine, mild, cloudy morning, and continued cloudy most of the day; mild and dark at night.
6	49 47	30.6	W. Little.	{ Fine mild morning, with some sunshine at nine; mild and cloudy after ten; little sun after; very dark at night.
7	47 44	30.6 30.5	W. Most calm.	{ Fine mild morning, with sun at nine; cloudy after ten, with sun at times this day; very dark at night.
8	44 40	30.1 30	W. Most calm.	{ Very cloudy this morning, and something sharp, which continued most of the day; some rain at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	44	30	W.	Cloudy, with rain this morning; a shower of snow in the forenoon, with frequent showers of snow at times all day; sharp and clear at night; ther. 30 at ten.
10 n.	38 30		Pretty sharp.	
10	39	30	N.	Very sharp this morning, and wind very cold; clear, with sunshine at mid-day; clear, with a sharp frost this night; ther. 28 at twelve.
12 n.	37 28	29.8 29.5	Pretty	
11	38	29.5	N.E.	Sharp frost this morning; Dublin mountains covered with snow; some sun through the day, with hail showers; sharp frost at night; ther. 29 at ten.
10 n.	36 29		Little.	
7 m.	23			Sharp frost this morning; ther. 23 at seven; sun at eight; clear with sunshine at times; ground white with snow; showers of snow in the day; sharp frost at night.
12	38			
	36	29.8 29.6	N.E. Little.	
7 m.	20			Very sharp frost this morning; ther. 20 at seven; sun at eight; fine sunshine all day, with a sharp frost; sharp frost and clear at night; ther. 26 at ten.
13	37	29.5	N.	
10 n.	35 26	29.4	Little.	
7 m.	22			Very sharp frost this morning; ther. 22 at seven; sunshine at nine; cloudy, with some sun at times; sharp frost at night; ther. 28 at ten.
14	38	29.5	N.	
10 n.	36 28	29.4	Little.	
7 m.	23			Sharp frost this morning, with white rime; ther. 23 at seven; sun at nine; fine clear sunshine most of the day; fine mild night.
15	40	29.7	N.	
	39	29.6	Most calm.	
16	44	29.5	E.	Frost all gone; this morning mild; ther. 40 at ten; cloudy, with some showers of rain; fine night and dark.
	40	29.7	Little.	

MARCH.

18

Day.	Ther.	Bar.	Wind.	
17	38 36	29.6	E. Very high.	{ Very cloudy this morning, and wind very high; very stormy all day, with dashing rain; stormy dark night, with rain.
18	39 39	29.5	E. Very High.	{ Very cloudy this morning, with heavy showers of rain at times through the day; sharp with heavy rain at night.
19	41 40	29.6 29.1	E. Little.	{ Cloudy this morning and wind very sharp; mild in the afternoon; fine clear night.
20	42 40	29.7 30	N.E. Little.	{ Mild, cloudy morning, and continued cloudy all day; pretty mild and dark at night.
7 m. 21	28 41 40	30	S.W. N.E. Little.	{ Sharp white frost this morning; ther. 28 at seven; fine clear sunshine all day; very fine clear night.
22	49 47	29.8	S. Very little.	{ Very fine, mild morning, with sunshine most of the day; fine clear night.
23	49 42	29.7 29.6	S. Most calm.	{ Very mild and cloudy this morning, with some rain; cloudy afterwards, with a little sun at times; fine clear night.
24	48 47	29.6 29.7	S.E. Little.	{ Very fine, clear, mild morning; with fine sunshine which continued all day; fine clear night.
25	49 47	29.7 29.8	S.E. Little.	{ Very fine clear morning, with sunshine most of the day; fine mild night, and dark.
26	47 43	29.8 30	S. Very little.	{ Fine, cloudy, mild morning; some sunshine at twelve; fine calm night.
27	49 44	30.1	S.E. Little.	{ Thick fog this morning, and continued so till eleven; some little sun in the afternoon; fine night, but dark.
28	48 46	30 30.1	S.E. Little	{ Fine mild morning, with some sunshine at times the most of day; fine night.

Day.	Ther.	Bar.	Wind.	
29	49 47	30.1 30.2	E. Little.	{ Fine, mild, cloudy morning, and continued cloudy all day; fine mild night with stars.
30	48 45	32.2	E.S. E. Little.	
31	50 48	30.2	S.E. Little.	{ Fine cloudy mild morning, and continued cloudy most of the day; clear moonlight night.

Rain Gauge 2 Inches, 52 Parts.

APRIL, 1806.

Days.	Ther.	Bar.	Wind.	
1	48 44	30.3	S.E. Little.	{ Fine mild morning; sunshine at ten; cloudy in the forenoon; sun at times; afternoon fine; clear night.
7. m.	29 42	30.3	S.E.	{ A little white frost this morning, ther. 29 at seven; a little sun at nine; cloudy after, with a little sun at times; fine night.
2	44	30.2	Little.	
3	51 48	30.2	S.E. Little.	{ Cloudy and mild this morning; continued cloudy all day; some drops of rain in the afternoon; fine moonlight this night.
4	48 44	30.2	E. Little.	{ Cloudy morning, with sunshine at times in the day; clear and sharp at night.
5	41 40	30.1	E. Pretty high.	{ Very stormy this morning, and wind high, which continued all day; some rain at twelve; dark and sharp at night.
6	49 44	29.8	S.E. Little.	{ Cloudy morning; very stormy, and rain at eleven; dashing rain at six; dark at night.
7	51 45	29.8	S.E. Little.	{ Fine mild morning, with sunshine at nine; a little rain at ten; cloudy, with sun at times after; fine night, and dark.
8	51 48	29.8	S.E. Little.	{ Fine clear morning, with sunshine at eight; fine clear sunshine all day afterwards; fine night.
9	46 48	29.7	E. Little.	{ Cloudy, and wind pretty high this morning; very cloudy all day afterwards; fine night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
10	51 44	29.6	E. Very high.	{ Cloudy mild morning till twelve; some rain from that till five; heavy dashing rain afterwards; high wind; very stormy and dark night.
11	42 41	29.6	E. Very high.	{ A very stormy night, with rain; cloudy morning; continued cloudy, and some sunshine at four; sharp night.
12	42 40	29.6	S.E. Little.	{ Cloudy this morning, with some showers of snow; some sleet in the forenoon; a little sun at four; heavy showers of snow at night; ground white.
13	40 39	29.7	E. Little.	{ Sharp this morning; some snow on the ground; frequent show- ers of snow; dark at night, with showers of sleet.
14	42 38 10. m. 26	29.8	S.E. Little.	{ Pretty sharp this morning, with showers of snow; cloudy and sharp afterwards; sharp and clear this night, ther. 26 at twelve.
6. m. 29 15 43 40 9. n. 32		29.8	S.E. Little.	{ Pretty sharp white frost this morning; ther. 29 at six; fine clear sunshine all day; fine clear night; ther. 32 at nine.
16	52 51	30.3	S.E. N.W. Little.	{ A little white frost this morning; fine sunshine, which conti- nued all day; fine night.
17	58 52	30.4	W. Sharp.	{ Very fine clear morning, with fine sunshine all the day; fine mild night.
18	56 54	30.0	W. Little.	{ Fine mild and cloudy, which continued all the day; some little rain at times; fine mild night.
19	60 62	30.3	W. Little.	{ Fine and mild, which continued all day; sunshine at times; fine night; dark.

Day.	Ther.	Bar.	Wind.	
20	62 28	30.3	W.S. W. Little.	{ Fine, but cloudy, which continued all day, with rain at times, fine night, but very dark.
21	60 68	30.3	S.E. N.W. Little.	{ Very fine mild morning, with sunshine till ten; cloudy, with sun at times afterwards; fine moonlight at night.
22	62 60	30.4	S. Little.	{ Fine mild morning, with sunshine at seven; fine clear sun afterwards; moonlight this night.
23	59 58	30.4	S. Little.	{ Fine morning, with sunshine at seven, which continued all day, wind a little sharp; fine clear moonlight this night.
24	58 58	30.4	W. Little.	{ Mild fine morning, with sunshine at eight, which continued all day; fine clear moonlight night.
25	56 53	30.3	S.W. N.W. Little.	{ Fine sunshine this morning till ten; cloudy after, with showers; fine clear moonlight at night.
26	58 53	30.3	N.W. Little.	{ Fine mild cloudy morning, which continued most of the day, with sunshine at times; clear moonlight at night.
27	49 53	30.2	N.W. Little.	{ Stormy this morning, and wind very high; some showers of rain in the day at times; some rain at seven; very clear, at night.
28	51 51	30	N.W. Little	{ Fine mild cloudy morning; heavy showers at five; fine night; wind high.
29	52 50	29.7	W.N. W. High.	{ Fine cloudy morning; wind a little sharp; sun at times; very sharp this night.

Day.	Ther.	Bar.	Wind.	
30.	59 51	29.5	W.N. W. Little.	{ Fine cloudy morning; some showers at times in the fore- noon; a little sunshine after; fine this night.

Rain Gauge 1 inch 00 parts.

MAY, 1806.

Day.	Ther.	Bar.	Wind.	
1	52 53	29.4	N.E. High.	{ Stormy this morning, with a little rain; cloudy, with a little sunshine at times afterwards; fine night.
2	60 55	29.6	N.E. High.	{ Cloudy this morning, with sun at nine, which continued at times all day; sharp wind this night.
3	50 48	29.7	E. Sharp.	{ Something cold this morning, and wind sharp, which continued all day; very stormy this night, and cold.
4	38 40	30.2	E. High.	{ Very cold and stormy this morning; and continued so all day; fine night.
5	53 53	30	S.E. Little.	{ Fine cloudy morning, and some sunshine at nine; fine sunshine all day afterwards; fine moonlight this night.
6	56 55	29.8	N.E. Little.	{ Clear morning, with sunshine at nine; fine sunshine all day afterwards; fine night.
7	58 58	29.8	E. Very Little.	{ Fine sunshine this morning, and continued till one; a little cloudy in the afternoon; fine clear night.
8	59 59	29.8	S.E. Little.	{ Clear morning with sunshine, which continued all day; fine clear night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	59 57	29.8	S.E. N.W. Little.	{ Cloudy mild morning, which continued till noon; a little sunshine in the afternoon; fine night but dark.
10	58 56	29.7	S.E. N.W. Little.	{ A mild morning, and continued so all day; a little sun in the afternoon; dark at night.
11	56 56	29.7	E. Little.	{ Cloudy, with small rain most of the day; fine night.
12	53 51	29.7	N.E. Most calm.	{ Very cloudy this morning, and continued so all day till dark; close small rain after.
13	45 44	29.6	S.E. Little.	{ Heavy rain last night, with rain most of this day, and rain at times at night.
14	53 52	29.4	S.W. Little.	{ Cloudy this morning with close small rain, which continued till noon; heavy rain after; heavy showers at night.
15	56 55	29.4	W. Little.	{ Close morning, with a little sun at eight, and sun at times after; fine night.
16	53 52	29.7	W. Little.	{ Clear fine sunshine this morning, and continued so till one; cloudy with sun at times after; fine night.
17	56 54	30	S.E. N.W. Little.	{ Very cloudy this morning, which continued most of the day, with sunshine at times; fine night and dark.
18	59 58	30.2	S.E. Little.	{ Very fine clear sunshine all this day; fine night.
19	66 65	30.3	S.E. N.W. Little.	{ Fine clear morning, which continued all day; fine night.
20	65 64	30.2	E. Little.	{ Very fine clear morning with sun; sunshine all day; clear moonlight night.

Day.	Ther.	Bar.	Wind.	
21	66 65	30.2	N.E. Little.	{ Very fine clear morning, with clear sunshine all day; clear moonlight night.
22	60 58	30.2	N.E. Little.	{ Fine clear morning, with fine sunshine all day; clear moonlight night and cold.
23	58 57	30.2	N.W. Little.	{ Very fine clear sunshine this morning, which continued all day; fine mild night.
24	62 62	30	S. Little.	{ Very fine clear sunshine this morning, and continued all day; very dark at night.
25	63 63	29.8	S. Little.	{ Fine clear morning, with fine sunshine all day; fine mild night.
26	63 63	29.8	S. Little.	{ Fine clear morning with fine sunshine all day; mild this night, with a little rain.
27	70 67	30	S. Little.	{ Fine clear morning, with fine sunshine all day; fine mild night.
28	63 60	30.1	S. Little.	{ Clear this morning, with fine sun till nine; cloudy afterwards, with sun at times; fine night but dark.
29	63 64	30	S.E. N.W. Little.	{ Cloudy this morning and mild; fine sunshine after ten; fine night.
30	67 63	29.8	N.E. Little.	{ Mild cloudy morning, with sunshine at times all day; fine light night.
31	64 62	29.8	N.E. Little.	{ Cloudy mild morning, with sunshine at eight; cloudy all the day after; sharp at night.

Rain Gauge 2 Inches, 94 Parts.

JUNE, 1806.

Day.	Ther.	Bar.	Wind.	
1	65 64	30	S.E. N.W. Little.	{ Very fine clear sunshine this morning, which continued all day; fine mild night.
2	62 63	30	S.W. Little.	{ Very fine cloudy morning; a little sunshine at seven; cloudy afterwards, with sun at times; clear fine night.
3	64 62	30	S. Little.	{ Fine mild cloudy day, with sunshine at times; cloudy this night with a little rain.
4	56 55	29.6	S.E. Little.	{ Small close rain this morning till ten; heavy rain at eleven; cloudy with showers in the afternoon; fine at night.
5	58 51	29.4	S.W. Little.	{ Cloudy and mild this morning, with sunshine at times; a little rain in the afternoon; heavy showers at night.
6	64 62	29.4	W. Very high.	{ Wind very high this morning, and stormy, which continued all day, with sun at times; fine night.
7	63 62	29.7	S.W. Little.	{ Fine mild cloudy morning, which continued most of the day, with sun at times; fine night.
8	68 65	29.8	S.W. Very high.	{ Fine warm clear sunshine, and continued all day; mild night, with some rain.
9	71 68	29.8	S.W. Little.	{ Cloudy this morning, and wind pretty high, which continued all day, with sunshine at times; fine night.

<i>Days.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
10	68 67	30	W. Little.	{ Very fine mild morning, which continued all day, with sunshine at times; fine night.
11	66 67	30.1	W. Little.	{ Very clear this morning, and fine sunshine all day; fine mild and clear this night.
12	71 69	30.3	W. Little.	{ Very fine cloudy morning, with sunshine at nine; cloudy afterwards, with sun at times; fine night.
13	69 68	30.2	W. Little.	{ Very fine clear morning, with fine sunshine all day; fine mild night.
14	68 67	30.2	W. Little.	{ Very fine clear morning, with fine sunshine with clouds at times; fine night.
15	65 64	30.2	N.W. Little.	{ Very fine clear warm morning, with fine sunshine, which continued all day; fine night.
16	74 69	30.2	S.E. Little.	{ Very fine clear morning, and wind; a little sharp; something cloudy after ten, and sun at times; fine night.
17	65 62	30.2	S.E. Little.	{ Fine clear morning, with sunshine all day; fine night.
18	65 64	30.2	S.E. Little.	{ Very fine clear sunshine this morning, which continued all day; fine night.
19	67 65	30.4	S.E. Little.	{ Very fine clear sunshine this morning, which continued all day; fine night.
20	66 67	30.2	S.W. Little.	{ Fine clear morning, with sunshine, which continued all day; fine night.
21	66 64	30	S.W. Little.	{ Very fine clear sunshine this morning, which continued all day; fine night.
22	74 69	30.2	W. Pretty high.	{ Very mild this morning, and cloudy; no sun this day; fine night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
23	65 64	30.1	N.W. Little.	{ Very fine mild cloudy morning, which continued most of the day, with some sun at times; fine night.
24	63 62	30.1	N.W. Little.	{ Cloudy this morning, with sunshine at times; fine sun after all day; fine clear night.
25	65 64	30 29.8	N.W. Little.	{ Cloudy mild morning, with a little misling rain; fine after ten, with sun at times.
26	63 62	29.9	N.W. Little.	{ Cloudy mild morning, with sunshine at times all day; fine night.
27	61 63	30	N.W. Little.	{ Fine clear morning, with sunshine at times all this day; wind a little sharp; dark at night.
28	65 66	30	N.W. Little.	{ Cloudy mild morning, with sunshine at times the most of the day; dark at night.
29	70 68	30	N.W. High.	{ Clear morning, with wind very high, and continued so all day; fine night, with a little rain.
30	68 64	30	N.W. Little.	{ Fine small rain all the morning; fine and clear sunshine afterwards; fine night.

Rain Gauge 0 inch 90 parts.

JULY, 1806.

Day.	Ther.	Bar.	Wind.	
1	64 63	29.8	S.W. N.E. High.	{ Very fine clear morning, with fine sunshine; with wind pretty high in the afternoon; fine night.
2	70 71	30	S.W. Little.	{ Very fine clear sunshine, which continued all day; fine clear night.
3	67 64	30.1	S.S. W. Little.	{ Very fine clear morning, which continued all day, with fine sunshine; fine mild clear night.
4	66 65	29.8	E.S. E. Little.	{ Very fine clear morning, with fine sunshine all day; fine mild night.
5	65 64	29.8	N.W. Most calm.	{ Fine mild morning, and cloudy till ten; fine afterwards, and sunshine at times; fine mild night.
6	69 64	29.6	N.W. Little.	{ Very clear warm morning; ther. 70 at eight; fine mild day afterwards, with sunshine; mild warm night.
7	72 64	29.5	W. Little.	{ Very fine clear warm morning, with fine sunshine, which continued all day; fine night.
8	72 69	29.5	S.W. Little.	{ Fine clear warm morning, with fine sunshine till ten; cloudy after, with fine small rain; fine night.
9	73 67	29.8	S.W. Little.	{ Very clear warm morning, with fine sunshine, which continued all day; fine night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
23	65 64	30.1	N.W. Little.	{ Very fine mild cloudy morning, which continued most of the day, with some sun at times; fine night.
24	63 62	30.1	N.W. Little.	{ Cloudy this morning, with sunshine at times; fine sun after all day; fine clear night.
25	65 64	30 29.8	N.W. Little.	{ Cloudy mild morning, with a little misling rain; fine after ten, with sun at times.
26	63 62	29.9	N.W. Little.	{ Cloudy mild morning, with sunshine at times all day; fine night.
27	61 63	30	N.W. Little.	{ Fine clear morning, with sunshine at times all this day; wind a little sharp; dark at night.
28	65 66	30	N.W. Little.	{ Cloudy mild morning, with sunshine at times the most of the day; dark at night.
29	70 68	30	N.W. High.	{ Clear morning, with wind very high, and continued so all day; fine night, with a little rain.
30	68 64	30	N.W. Little.	{ Fine small rain all the morning; fine and clear sunshine afterwards; fine night.

Rain Gauge 0 inch 90 parts.

JULY, 1806.

Day.	Ther.	Bar.	Wind.	
1	64 63	29.8	S.W. N.E. High.	{ Very fine clear morning, with fine sunshine; with wind pretty high in the afternoon; fine night.
2	70 71	30	S.W. Little.	{ Very fine clear sunshine, which continued all day; fine clear night.
3	67 64	30.1	S.S. W. Little.	{ Very fine clear morning, which continued all day, with fine sunshine; fine mild clear night.
4	66 65	29.8	E.S. E. Little.	{ Very fine clear morning, with fine sunshine all day; fine mild night.
5	65 64	29.8	N.W. Most calm.	{ Fine mild morning, and cloudy till ten; fine afterwards, and sunshine at times; fine mild night.
6	69 64	29.6	N.W. Little.	{ Very clear warm morning; ther. 70 at eight; fine mild day afterwards, with sunshine; mild warm night.
7	72 64	29.5	W. Little.	{ Very fine clear warm morning, with fine sunshine, which continued all day; fine night.
8	72 69	29.5	S.W. Little.	{ Fine clear warm morning, with fine sunshine till ten; cloudy after, with fine small rain; fine night.
9	73 67	29.8	S.W. Little.	{ Very clear warm morning, with fine sunshine, which continued all day; fine night.

Day.	Ther.	Bar.	Wind.	
10	72 67	29.8	S.W. Little.	{ Cloudy morning, with sun at times till one; fine clear sunshine afternoon; fine night.
11	71 68	29.8	S.W. N.E. Very high.	{ Fine mild warm and cloudy morning, with sunshine at times till one; heavy dashing rain from one till two, with thunder; cloudy sharp night.
12	67 66	30	S.W. Little.	{ Cloudy with sunshine at times this forenoon; a shower at one; cloudy fine night afterwards.
13	69 64	29.7	W. Little.	{ Fine mild cloudy morning, with sunshine at times; heavy rain all the afternoon; fine night.
14	68 64	29.6	W. Little.	{ Cloudy morning, with heavy showers at times all day; thunder at one; fine night.
15	68 69	29.6	W. Little.	{ Mild cloudy morning, with sunshine at times till one; very showery, with thunder in the afternoon; cloudy night with rain at seven.
16	68 56	29.5	S.W. N.E. Little.	{ Cloudy this morning till ten; cloudy in the forenoon, with heavy dashing rain at times; heavy shower of hail at noon; dashing rain in the afternoon, and loud thunder; mild night, with rain at seven.
17	62 55	29.5	S.E. Little.	{ Cloudy morning with sunshine at times; very heavy rain in the afternoon; fine night.
18	64 64	29.6	S.E. Little.	{ Cloudy, and sunshine at nine this morning; fine sunshine in the forenoon; cloudy afternoon; fine night.
19	67 68	29.8	E. Little.	{ Very cloudy and dull all this day; no sun; fine night, but very dark.

JULY.

27

Day.	Ther.	Bar.	Wind.	
20	68 64	29.7	S.E. Little.	{ Cloudy with a little sunshine at nine; cloudy after ten, with some rain at times; fine night but dark.
21	68 63	29.7.	E. Little.	{ Fine mild cloudy morning which continued most of the day, with sunshine at times; fine night.
22	64 62	29.5	S.E. N.W. Little.	{ Fine clear morning with fine sunshine most of the day; very mild this night, with rain at ten.
23	63 61	29.5	N.E. High.	{ Very stormy morning, with rain at times till nine; very cloudy afterwards, with some sun at times; fine night.
24	64 62	29.6	N.E. Little.	{ Very fine mild cloudy morning, with a little sunshine at times; some rain at nine this night.
25	60 59	29.5	E.N. E. Little.	{ Very fine clear sunshine this morning, which lasted till noon; cloudy after, with sunshine at times; fine night.
26	64 62	29.6	N. Little.	{ Very fine morning with sunshine at times, which continued all day; fine night.
27	72 64	29.5	N.E. Little.	{ Fine clear morning, with sunshine till twelve; heavy rain at noon; fine sun after; fine night.
28	71 68	29.5	N.E. Little.	{ Very fine warm morning, with some sunshine, which continued all day; fine night.
29	68 66	29.6	E. Little.	{ Very fine sunshine this morning, which continued all day; fine night.
30	72 68	29.5	S.E. N.W. Little.	{ Cloudy this morning, with sunshine at nine; cloudy with heavy showers afterwards; fine night.

28

JULY.

Day.	Ther.	Bar.	Wind.	
31	69	29.6	S.E.	{ Cloudy this morning, with sun- shine at times till noon; heavy showers of rain in the afternoon; fine night.
	68		N.W.	
			Pretty sharp.	

Rain Gauge 3 inches 2 parts.

AUGUST, 1806.

Day.	Ther.	Bar.	Wind.	
1	69 68	29.7	S.E. N.W. Little.	{ Mild and cloudy this morning, with some sunshine at times till noon; heavy rain in the afternoon; fine night.
2	69 67	29.5	W.W. N.W. Little.	{ Very fine cloudy day, with fine sunshine at times this day; a very fine mild night.
3	69 65	29.7.	W.N. W. Very sharp.	{ Very fine cloudy morning, which continued all day; wind sharp; fine night.
4	68 67	30.1	W. Little.	{ Very fine sunshine this morning, and continued at times all day; fine pleasant night.
5	72 66	30	W. Little.	{ Heavy rain this morning at six; mild, with sunshine at nine; cloudy all day after; fine night.
6	72 69	29.7	W. Little.	{ Very fine mild morning, with fine sunshine at times, which continued all day; fine night.
7	72 72	29.7	W. Most calm.	{ Very fine mild warm morning, which continued all day, with fine sunshine at times; fine at night.
8	69 68	29.7	W. Little.	{ Fine cloudy morning, with sun- shine at nine; fine, with sun- shine at times all day; sharp at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	75 71	29.8	W. Little.	{ Very fine clear morning, with sunshine all day, and very warm; fine mild night.
10	70 64	30	W. Little.	{ Very mild morning, which con- tinued all day, with fine sun- shine at times; fine night.
11	71 65	30	W. Little.	{ Fine mild cloudy morning, with fine sunshine till noon; heavy showers most of the afternoon; fine night, with a heavy dew.
12	65 66	29.8	W. Sharp	{ Cloudy morning, with sunshine at times; rain in the forenoon, with sun at times; fine clear afternoon; mild night.
13	67 65	29.8	W.N. W. Little.	{ Cloudy, with sunshine at nine; cloudy, with sunshine at times afterwards; fine night.
14	68 67	30	N.N. W. Little.	{ Fine cloudy morning, with sun- shine at nine; a smart shower at noon; fine sunshine after; clear night.
15	68 66	29.8	W. Little.	{ Cloudy morning, with sunshine at eight; cloudy, with sun- shine at times after; fine clear night.
16	64 66	30	W. Most calm.	{ Very mild and cloudy this morn- ing, and continued till noon; a little sunshine in the after- noon; fine night.
17	72 72	30	E.N. E. Little.	{ Cloudy this morning, with sun- shine at nine; cloudy after- wards, with sun at times, dark at night, with close fog.
18	68 65	30	E.N. E. Little.	{ Mild cloudy morning, with sun at eight; cloudy, with sun at times; thick fog at night.
19	69 66	29.8	E.N. E. Little.	{ Fine morning, with sunshine at times all day; rain this night with a great deal of thunder.

AUGUST.

51

Day.	Ther.	Bar.	Wind.	
20	72 69	29.8	S.E. N.W. Sharp.	{ Fine cloudy day, with sunshine at times; close fog this night.
21	72 69	29.5	W.N. W. Little.	{ Very mild this morning, with thick fog till seven; fine sunshine at times all day; fine clear night.
22	68 64	29.6	W. Little.	{ Fine cloudy morning, which continued most of the day, with sunshine at times; fine clear night.
23	71 68	29.7	W. Very high.	{ Cloudy this morning, with showers of rain; very warm, with sunshine; wind very high; clear stormy night.
24	71 68	29.8	N.W. high.	{ Fine mild cloudy morning, with sunshine at nine; cloudy with showers of rain at times; fine clear sharp night.
25	68 61	29.8	S.E. N.W. Very high.	{ Very cloudy this morning, with some rain at times all day; wind very high in the afternoon; sharp night.
26	61 59	29.7	N.W. Little.	{ Very cloudy this morning and continued all day; fine mild night.
27	64 61	29.2	N.W. Little.	{ Fine mild cloudy morning, which continued part of the day, with sunshine at times; fine mild night.
28	61 60	29.4	W.N. W. Little.	{ Pretty clear this morning, with a little sunshine till seven; cloudy all day after; wind sharp; fine night.
29	61 60	29.4	S.W. Little.	{ Cloudy this morning which continued most of the day, with sun at times; fine clear night.
30	62 61	29.4	S.E. Little.	{ Cloudy morning, with some rain at noon; a little sunshine in the afternoon; fine clear night.

Day.	Ther.	Bar.	Wind.
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31	65 61	29.6	S.E. Little.
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{ Clear sunshine this morning till
seven ; cloudy and mild, with
sun at times afterwards ; fine
night.

Rain Gauge, 1 inch 29 parts.

SEPTEMBER, 1806.

Day.	Ther.	Bar.	Wind.	
1	68 66	29.7	E.N. E. Little.	{ Cloudy this day, with sunshine at times all day ; some rain at six ; fine night afterwards.
2	66 66	30.1 29.8	S.E. Little.	{ Mild cloudy morning, which continued all day, with sunshine at times ; fine night.
3	66 64	29.4	S.E. N.W. High.	{ Very heavy rain this morning from five till eight ; cloudy, with sunshine at times and rain afterwards ; fine night.
4	58 58	29.5	N.W. Little.	{ Cloudy, with small rain all this morning ; cloudy after, with rain in the afternoon ; very dark at night.
5	59 58	29.6	W. Pretty sharp.	{ Cloudy most of this day ; a little sunshine at noon ; wind sharp in the afternoon ; fine night.
6	58 59	29.7	W. Little.	{ Cloudy and dark all this day ; wind sharp ; dark at night.
7	60 61	29.6	S.W. N.E. Little.	{ Rain most of this day, and rain at times in the night.
8	64 61	29.5	W. Little.	{ Fine mild cloudy day, with sunshine at times ; fine night, but dark.
9	62 61	26.6	S.W. Little.	{ Fine mild day, with sunshine at times all this day ; dark at night.
10	59 59	29.6	W.S. W. Little.	{ Cloudy this morning ; a shower of rain at eleven ; showers in the afternoon ; rain at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
11	55 60	29.6	W.S. W. Little.	Mild this morning with fine sunshine at eight; a very heavy shower of hail at ele- ven or a little after; dark at night.
12	64 62	30	W. Little.	Cloudy this day, with sunshine at times; fine night.
13	61 60	30	S.W. Little.	Very fine mild cloudy day; fine night, but very dark.
14	61 59	29.8	N.W. High.	Cloudy morning with heavy small rain, which continued at times all day; fine night.
15	60 61	30	N.W. Little.	Fine morning, with clear sun- shine all day; fine night.
16	61 61	30.1	N.W. Little.	Fine cloudy morning, with sun- shine at times all day; fine night, but dark.
17	62 61	30.2	W. Little.	Mild morning with sunshine at eight; fine sun at times after- wards; dark sharp night.
18	62 64	30.1	W. High.	Fine clear morning, with some rain and sunshine at times; fine clear sunshine all day afterwards; fine night.
19	64 65	30	W.N. W. Pretty high.	Fine cloudy morning, which continued all day, with sun- shine at times; wind high and sharp; fine night.
20	62 65	30	W.N. W. High.	Cloudy this morning, with wind high and stormy all day; after ten sharp; clear night.
21	65 60	29.8	S.W. Little.	Fine clear morning; wind pretty high; cloudy after ten, with a a little rain in the afternoon; sharp this night, with showers.
22	60 60	29.8	S.W. Little.	Cloudy this morning, with some rain at times till noon; a little sun in the afternoon; fine night.

SEPTEMBER.

35

Day.	Ther.	Bar.	Wind.	
23	62 58	30	S.W. Little.	{ Clear morning, with sunshine at eight, which continued till noon; small rain in the afternoon; fine night.
24	58 54	30	S.W. Little.	{ Fine mild morning with sunshine at eight, and continued so all day; close fog at night.
	60 60	30.1	S.W. Little.	{ Cloudy this morning, with showers of rain; cloudy with sunshine at times afterwards; fine night.
26	61 60	29.8	S.E. N.W. Little.	{ Very cloudy this day, with some little sunshine at noon; fine night.
27	60 58	29.8	E. Little.	{ Very cloudy this morning, with some small rain at noon; fine night.
28	66 61	29.7	S.E. Little.	{ Very fine clear morning, with sunshine most of the day; fine clear night.
29	62 61	29.6	S.W. Little.	{ Very cloudy and mild, with some small rain at times till ten; cloudy afterwards and fine; dark at night.
30	65 58	29.7	S.W. Little.	{ Mild cloudy morning till ten; some rain at times afterwards; a heavy shower at seven; fine night afterwards.

Rain Gauge 2 Inches, 13 Parts.

OCTOBER, 1806.

Day.	Ther.	Bar.	Wind.	
1	59 56	29.8	E.S. E. Little.	{ Very fine clear morning, with fine sunshine all day; mild night, with a fog.
2	64 60	29.7	E.S. E. Little.	{ Fine cloudy morning, with sunshine in the forenoon; a heavy rain at times in the afternoon; fine clear night.
3	64 60	29.4	S.E. N.W. Little.	{ Cloudy mild morning, and so till noon; showers in the afternoon; rain at night.
4	57 50	29.7	N.W. Sharp.	{ Cloudy and rather sharp this morning, with wind rather high all day, with sun at times; fine clear night.
5	66 60	29.8.	W.S. W. Little.	{ Fine cloudy morning till ten; fine sunshine afterwards; dark this night with some small rain.
6	66 58	30.1	W. Little.	{ Very fine clear morning; fine all day, with sunshine most of the day; fine clear sharp night.
7	63 60	30.1	W.N. W. Most calm.	{ Very mild and cloudy this morning, which continued all day; fine night.
8	64 59	30.3	S.E. N.W. Little.	{ Fine mild cloudy day, with fine sunshine at times; fine night.
9	62 59	30.1	S.E. N.W. Little.	{ Very cloudy this morning, and continued all day; very fine clear night.

Day.	Ther.	Bar.	Wind.	
10	60 57	30.1	S.E. Little.	{ Cloudy mild morning, which continued all day; fine night.
11	59 54	30	S.E. Little.	{ Very mild and cloudy this morning, which continued all day; fine night.
12	60 58	29.8	S.E. Little.	{ Fine mild morning, with sunshine, which continued all day; dark at night.
13	58 57	29.8	E.N. E. Little.	{ Pretty sharp this morning, and cloudy all day, with a little sunshine at times; fine clear night.
14	58 55	29.8	E.N. E. Little.	{ Small heavy rain this morning; cloudy all day afterwards; fine dark night.
15	59 57	29.4	S.E. N.W. High at times.	{ Very cloudy this morning, with a little rain; a heavy shower of rain at four this afternoon; stormy dark night.
16	58 53	29.4	E. Little.	{ Cloudy mild morning, and continued all day; fine night, and dark.
17	55 53	29.6	E. Very sharp.	{ Cloudy morning, and continued all day; wind very high and stormy; fine night.
18	54 55	29.6	E. High and sharp.	{ Cloudy morning and wind very high and sharp, with a little sun at noon; dark night.
19	54 57	29.6	S.E. Little.	{ Cloudy this morning, with a little sunshine at noon; some rain in the afternoon; very dark night.
20	51 51	29.4	S.S. E. High.	{ Cloudy, with rain till eight, with sharp wind and some rain in the afternoon; some rain at night.
21	56 51	29	W.S. W. High.	{ Fine clear sunshine this morning, till noon; rain at times in the afternoon; fine clear night.

Day.	Ther.	Bar.	Wind.	
22	54 50	28.8	S.W. Little.	{ Fine mild morning, with sunshine at nine; cloudy afterwards; with rain in the afternoon; heavy rain at night.
23	41 40	29.7	W. Sharp.	{ Fine clear morning, with a little frost, ther. 31 at seven; fine clear sunshine afterwards; fine clear night.
7 m. 24	30 49 48	29.8	W. Little.	{ White frost this morning, ther. 30 at seven; fine clear sunshine all day; fine night.
25	61 60	29.7	W. Very stormy.	{ Very cloudy this morning, and wind very high, which continued all day, with sunshine at times; fine night, with a shower at eleven.
26	59 54	29.7	E. Little.	{ Mild and cloudy this morning, with sunshine at times; heavy rain at six; fine night.
27	61 60	29.6	E. Little.	{ Mild and cloudy this morning, with sunshine at times; rain in the afternoon; fine clear night.
28	60 57	29.6	W. Pretty high.	{ Heavy rain at times this morning, which continued all day; a little sun at three; fine clear night.
29	61 57	30	S.W. N.E. Pretty high.	{ Fine mild morning, with fine sunshine most of the day; fine night.
30	55 55	29.7	S. High.	{ Rather sharp this morning, with a little sunshine at times; fine night.
31	54 52	29.7	W.N. W. High.	{ Cloudy morning, with a heavy rain at times; heavy rain till twelve; fine afternoon; fine night.

Rain Gauge 1 inch 67 parts.

NOVEMBER, 1806.

Day.	Ther.	Bar.	Wind.	
1	60 57	29.4	S.W. N.E. Little.	{ Fine mild cloudy morning, with fine sunshine at times; fine clear night.
2	55 56	28.8	S.E. Very high.	{ Dashing rain, and wind very high this morning; uncom- monly stormy this day, with sunshine at times and rain; very dark at night.
3	52 46	28.1	S.E. Little.	{ Cloudy this morning, and hard keen rain early; cloudy after- wards, with sunshine at times; fine night.
4	48 44	29.4	S.E. N.W. Little.	{ Cloudy this morning, and pretty sharp, which continued all day; clear sharp night.
5	48 43	29.7	W.S. W. Little.	{ Cloudy this morning, with sun- shine at eight; sunshine at times all day afterwards; sharp this night.
6	44 40	29.6	W. Sharp.	{ Pretty sharp this morning, with sunshine at eight; fine clear sunshine all day after; fine clear sharp night.
7	44 41	30	S.E. Stormy.	{ Cloudy this morning, with rain at one; dashing rain most of the afternoon; heavy rain this night, and dark.
8	58 54	29.3	S.E. N.W. Little.	{ Pretty sharp cloudy morning, with sunshine at ten; some showers in the afternoon; dark, and wind high this night, with some rain.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	55 54	29.8	E. Very little.	{ Cloudy morning with sunshine at twelve; dashing heavy rain from four till seven; stormy, with rain at times this night.
10	51 51	30	N.E. E. Little.	{ Very cloudy this morning, with a shower at twelve; cloudy afterwards; fine night.
11	50 48	30.1	S.E. N.W. Little.	{ Very cloudy dull day; dark close fog at night.
12	50 50	30.1	S.W. Pretty high.	{ Cloudy this morning till ten; fine sunshine at times afterwards; fine night.
13	54 53	30.1	S.W. Little.	{ Very cloudy this morning, with some rain at nine; cloudy afterwards, with rain in the afternoon; some rain at night.
14	53 53	30.1	W. Little.	{ Cloudy mild morning till ten; rain at twelve; cloudy afternoon; very dark at night.
15	51 45	29.7	W. Pretty high.	{ Fine morning, with a little rain at noon; fine clear afternoon, with sunshine at times; fine clear night.
16	48 44	29.6	W. Pretty high.	{ Fine clear sharp morning, with fine sunshine after ten; fine clear moonlight night.
17	51 49	29.6	W. Pretty high.	{ Fine clear morning, with sunshine most of the day; fine mild night.
18	51 48	29.6	S.W. Little.	{ Fine cloudy day; stormy and dashing rain this night.
19	48 46	29.4	W. Sharp.	{ Very stormy this morning, and continued all day; wind high; a little at times in the afternoon; dashing rain at night.

NOVEMBER.

41

Day.	Ther.	Bar.	Wind.	
20	44 42	29.4	W. Sharp.	{ Cloudy this morning, with sun- shine at nine; fine sunshine most of the day afterwards; some rain this night.
21	44 41	29.4	W. Little.	{ Cloudy, with rain at times all this day; fine moonlight at night.
7 m. 22	32 42 38	29.3	N.W. Little.	{ A little white frost this morning; ther. 32 at seven; fine clear sunshine most of the day after; sharp at night.
23	53 50	29.3	W. Pretty high.	{ Very stormy this morning, with some rain; sunshine most of the day after ten, and stormy; fine clear night.
24	50 52	29.8	S.E. N.W. Little.	{ Cloudy and mild most of this day, with rain at times; heavy rain at seven this night.
25	54 52	29.6	W. Little.	{ Very cloudy this morning, and continued all day, with rain most part of the day; fine mild night.
26	55 52	29.7	S.E. N.W. Little.	{ Fine cloudy day, with a little sunshine at times; heavy rain this night.
27	55 48	29.8	S.E. Little.	{ Cloudy this morning, with some rain; heavy small rain all day afterwards; some rain this night.
28	59 56	29.7	W. High at times.	{ Fine clear morning, with sun- shine till noon; some rain at times; very fine moonlight at night.
29	45 40	29.7	S.E. N.W. High.	{ Dashing rain this day till noon; clear with sunshine in the afternoon; fine clear night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>
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30	42	29.6
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41

W.

Little.

{ Fine clear morning, with sun-
shine till noon; cloudy, with
rain in the afternoon; dark,
with rain this night.

Rain Gauge 3 inches 92 parts.

DECEMBER, 1806.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
1	47 46	29.1	W. Little.	{ Fine cloudy morning, with some sunshine at nine; cloudy after ten, with rain most of the af- ternoon; dark with rain this night.
2	40 41	28.8	W. High.	{ Very stormy this morning, with rain and snow till twelve; clear sunshine at times; cloudy af- ter; dark at night.
3	45 42	29.8	W.N. W. Very high.	{ Cloudy with sunshine at nine; fine sunshine all day after; dark at night.
4	47 47	29.6	W. Little.	{ Mild cloudy day, with rain at times all day; very dark this night.
5	55 53	29.1	W. High and stormy.	{ Cloudy this morning, with some rain till ten; a little rain in the afternoon; fine night.
6	42 41	29.2	W. Sharp.	{ Fine clear sharp morning, and continued all day, with fine sunshine at times; fine night.
7	40 37	29.1	W. Sharp.	{ Fine clear day, with sunshine; clear this night till ten; a lit- tle rain after.
8	42 41	29.2	W. Little.	{ Fine mild morning; there had been rain in the night; mild after- wards, with rain at eleven; fine clear night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	41 40	29.2	W. Very little.	{ Fine clear morning, and sharp, with sunshine at times all day; fine night.
10	47 47	29.2	W. Very little.	{ Cloudy mild morning, with some rain in the forenoon, which continued all night.
11	45 44	29	W. Little.	{ Fine clear morning, with sun- shine till noon; cloudy after- noon; fine night.
12	47 43	28.5	S.E N.W. Little.	{ Very cloudy and dark this morn- ing, with some rain at nine; cloudy afterwards; fine night.
13	48 46	28.6	W. Sharp.	{ Very fine clear day, with sun- shine; fine mild night.
14	43 43	28.1	W. Sharp.	{ Fine clear sunshine all this day; clear night.
15	45 42	28.8	W. Not much.	{ Cloudy sharp morning, which continued all day; some rain at four; heavy dashing rain at night.
16	49 50	29	W. High.	{ Rain this morning, which conti- nued till noon; cloudy after- noon; fine mild night.
17	50 46	29.5	W. Little.	{ Very fine cloudy morning, and continued till noon; some rain in the afternoon, with rain at night.
18	49 47	29.6	W. Little.	{ Fine mild cloudy day; fine star- light at night.
19	47 48	29.6	W. Sharp.	{ Very mild and cloudy this morn- ing, with fine sunshine at noon; rain at night.
20	45 44	29.5	W. Little.	{ Close rain all this day; fine clear moonlight at night.

Day.	Ther.	Bar.	Wind.	
21	40 43	29.6	S.E. Little.	{ Pretty sharp white frost this morning; cloudy with sunshine at times after; fine night.
22	45 47	29.8	W. Little.	{ Fine cloudy morning, with sunshine at times all day; fine clear moonlight this night.
23	47 51	30	W. Little.	{ Fine mild cloudy day; some rain at times this night.
24	45 50	30	W. Most calm.	{ Fine clear mild morning; there had been much rain in the night; clear sunshine this day at noon; fine clear moonlight this night.
25	48 44	30	W. uncom. high.	{ Wind uncommonly high all last night, and continued all this day very stormy, with dashing rain, with sunshine at times this afternoon; fine clear moonlight this night.
26	45 42	29.7	W. Sharp.	{ Fine mild morning, with sunshine at ten; cloudy with sunshine at times afterwards; very fine clear night,
27	50 50	29.7	W. High.	{ Cloudy morning, with fine sunshine after ten; fine dry night.
28	52 50	29.7	S.W. Little.	{ Heavy small rain this morning, which continued all day; fine night, but dark.
29	49 47	29.7	S.W. Little.	{ Cloudy mild morning, and continued all day; fine night, but dark.
30	47 47	29.7	S.W. Little.	{ Cloudy, with some small rain this morning, which continued till noon; some rain this night.

31	50	30.1	S.W.	{	Very fine cloudy mild morning, with sunshine at times all day; fine night.
	52		Little.		

Rain Gauge 2 inches 22 parts.
Total 24 inches 4,9000 parts.

A

DIARY OF THE WEATHER.

Ther. Thermometer, is noted at noon, and four o'clock, and occasionally at other times. *Bar.* Barometer.

JANUARY, 1807.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
1	38 37	30.4	E. Little.	{ Fine sharp cloudy morning, with sunshine at mid-day, which continued all the afternoon; thick fog and frost; ther. 28 at night.
2	39 39	30.3	S.E. Little.	{ Cloudy and a little sharp this morning, with some rain in the afternoon; fine mild clear night.
3	42 43	30.3	S.E. Little.	{ Fine mild cloudy morning, with sunshine at nine; cloudy afterwards; fine night, but very dark.
4	42 41	30.4	W. Little.	{ Fine clear morning, with sunshine at eleven; cloudy afternoon; fine mild night.
5	42 42	30.4	W. Little.	{ Fine cloudy morning, which continued all day; fine mild night.
6	44 43	30.3	S.E. N.W. Little.	{ Very cloudy mild morning, and continued all day; fine mild night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
7	45 44	30	W. Little.	{ Fine clear mild morning, with fine sunshine; cloudy with some rain in the afternoon; fine mild night.
8	45 45	29.8	W. Little.	{ Mild cloudy morning, with showers of rain at times through the day; fine night.
9	43 41	29.8	S.W. Little.	{ Cloudy mild morning till ten; some sunshine at times afterwards; some rain at night.
10	45 46	30	E. Little.	{ Very fine mild morning, with sunshine at nine, which continued at times all the forenoon; cloudy noon; fine night.
11	42 42	30.2	W. Little.	{ Pretty sharp this morning, with sunshine this forenoon; some rain in the afternoon; fine night.
12	47 47	30	S.W. N.E. Little.	{ Fine mild cloudy day with sunshine at times; fine night.
13	42 39	29.8	N.W. Sharp.	{ Very cloudy this morning, and wind sharp, which continued all day; sharp at night, with frost; ther. 29 at ten this night.
14	36 39	29.8	E. Sharp.	{ Heavy snow all this morning, and the ground white; turned into rain at one, with rain in the afternoon; fine sharp night.
15	46 48	29.8	N.W. Sharp.	{ Cloudy this morning, with some rain; heavy rain most of the afternoon; clear sharp night.
16	50 50	29.9	S.W. Little.	{ Cloudy mild morning, with showers at times till noon; some sunshine in the afternoon; fine moonlight night.

Day.	Ther.	Bar.	Wind.	
17	47 44	29.7	W. Little.	{ Fine cloudy morning; and wind pretty sharp, with sunshine at noon; some rain in the afternoon; fine clear night.
18	40 39	29.3	N.W. Sharp.	{ Very fine clear sharp morning; continued so all day, and wind pretty sharp; fine night.
19	48 43	29.6	N.W. Sharp.	{ Clear sharp morning, and a little frost; cloudy, and heavy showers of rain in the afternoon; fine clear moonlight night.
20	42 41	29	W. Pretty sharp.	{ Fine clear day, with a little rain at noon; fine sunshine all day at times; fine night.
21	40 35	29.3	W. Sharp.	{ Fine clear sharp morning, with fine sunshine in the forenoon; a little rain in the afternoon; fine clear night.
22	32 34	29.4	E. Sharp.	{ Heavy dashing rain most of the morning, which continued till noon, with snow at mid-day; fine clear sunshine at half past three; fine clear night.
23	36 35	29.6	W. Little.	{ A little frost this morning, with fine sunshine after ten till night, and wind sharp; fine sharp night.
24	42 39	29.8	W. Little.	{ Fine mild cloudy day, with sun at times; fine clear night, with a little frost.
25	46 45	30	N.W. Sharp.	{ Very fine clear morning, with sun most of the day; fine night.
26	47 46	30.4	W. Little.	{ Fine mild morning, with fine sunshine till noon; some rain in the afternoon; small rain most of this night.
27	42 40	30.6	W. Little.	{ Pretty sharp, and fine sunshine this morning, which continued most of the day; a frost at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
28	55 37	30.7	W. Little.	{ Pretty sharp frost this morning; ther. 30 at eight; cloudy; no sun afterwards; fine mild night.
29	43 40	30.7	W.N. W. Sharp.	{ Fine cloudy morning; con- tinued so all day; fine clear night.
30	43 41	30	W. Little.	{ Some showers of rain, which con- tinued till noon; cloudy after- noon; fine clear night.
31	41 37	29.5	E. Pretty sharp.	{ Fine clear sunshine this morn- ing, which continued till noon; cloudy afternoon, with showers of rain and snow; fine clear night with frost; ther. 29 at ten.

Rain Gauge, 2 inches, 16000 parts

FEBRUARY, 1807.

Day.	Ther.	Bar.	Wind.	
1	33 33	29.5	N.W. Little.	{ Sharp frost this morning, ther. 28 at eight; fine clear sunshine all day afterwards; fine clear night, with sharp frost.
2	40 37	29	W. Little.	{ Fine clear sharp morning, with sunshine at times all day; fine clear sharp night.
3	38 37	29.3	N.W. Sharp.	{ A little frost this morning, with sunshine at nine; pretty sharp, and showers of rain in the forenoon; pretty sharp this night.
4	37 38	29.3	N.W. Little.	{ Fine cloudy morning; a shower of snow in the night; cloudy in the forenoon; small rain in the afternoon; fine sharp night.
5	40 38	29.2	N.W. Little.	{ Cloudy this morning and sharp; continued so all day, with some sunshine at times; fine cloudy night.
6	42 40	29.5	N.W. Little.	{ Pretty sharp this morning, with a little frost; cloudy after ten, with sun at times; a little rain at night.
7	40 39	29.7	N.W. Little.	{ Pretty sharp frost this morning; fine sunshine most of the day afterwards; fine clear night.
8	48 45	29.5	S.W. Little.	{ Cloudy, with some small rain this morning; fine clear sunshine at noon; some rain in the afternoon; fine clear night.

Day.	Ther.	Bar.	Wind.	
9	50 45	29.6 29.7	W. Very high.	{ Very fine clear mild morning, with fine sunshine most of the day; clear stormy night.
10	47 45	29.6	W. Little.	
11	55 52	30	W. Very high.	{ Very cloudy stormy morning, and mild; continued so all day; clear stormy night.
12	56 53	29.7	W.S. W. High.	
13	44 44	29.8	S.W. High.	{ Fine mild cloudy morning; continued so all day; fine mild night, with the moon shining at times.
14	52 49	30	S.W. Pretty high.	
15	57 54	29.7	S.W. Little.	{ Fine mild morning, with sunshine at eight; fine sun at times all day afterwards; fine moonlight this night.
16	48 43	29.8	W.N. W. Little.	
17	40 38	29.5	S.E. N.W.	{ Clear sharp morning, with showers of hail at noon; sunshine in the afternoon; heavy shower of snow at dusk; ground white at ten, and sharp frost, ther. 29 at ten.
10 n.	29		Little.	
7 m.	25			{ Very sharp frost this morning, ther. 25 at seven; ground covered with snow; showers of snow in the morning; fine clear sunshine all day; sharp frost, and very clear at night.
13	35 32	29.8 30	E. Little.	

Day. Ther. Bar. Wind.

7 m.	25			{ Sharp frost this morning, and ther. 25 at seven; cloudy and mild afterwards; cloudy this night, with small rain at nine.
19	39	30.3	W.N.	
	41		W.	
			Little.	
20	41	30	W.	{ Cloudy and mild this morning; wind high after ten, and con- tinued stormy all day; show- ers in the afternoon; some rain at night.
	47		Pretty high.	
21	45	29.7	W.	{ Fine morning, with sunshine till noon; showers in the afternoon; fine clear night.
	46		High.	
22	50	29.5	N.W.	{ Stormy morning, with a little sun- shine at eight; a shower of rain at noon; showers in the after- noon; fine clear night.
	47		High.	
23	47	29.7	N.W.	{ Fine clear sharp morning, with a little frost; wind sharp all day, with sunshine at times; fine clear night.
	45		Sharp.	
24	48	29.8	W.	{ Fine cloudy mild morning, with some sunshine at times; heavy shower of rain at four in the afternoon; mild with rain this night.
	47		Little.	
25	45	29.7	N.W.	{ Close small rain all this morning, and continued all day; fine clear night.
	42		Little.	
26	37	29.8	N.	{ Fine sharp clear morning, with sunshine at times all day; sharp frost this night, ther. 28 at ten.
	33	30.1	Little.	
10 n.	28			
7 m.	28			{ Sharp frost this morning, and ther. 28 at seven, with fine sunshine most of the day; pretty sharp frost this night; wind high.
27	36	30.2	N.	
	33		Sharp.	

Day.	Ther.	Bar.	Wind.
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7 m.	25		
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28	37		
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		30.6	
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			N.W.
--	--	--	------

			Sharp.
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Very sharp frost this morning,
ther. 25 at seven; some snow
on the ground; fine sunshine
all day; fine clear night, with
frost.

Rain Gauge 1 Inch, 5000 parts.

MARCH, 1807.

Day.	Ther.	Bar.	Wind.	
1	42 42	30.6	N.E. Little.	{ Pretty sharp frost this morning, and fine sunshine all day; fine night, but dark.
2	42 40	30.6	N. Little.	{ Fine mild day, with sunshine; fine clear night, with little frost this night.
3	42 37	30.4	N.E. Little.	{ Very fine mild morning; continued so all day, with sunshine at times; fine mild night.
4	38 32	30.1	N.E. Sharp.	{ Pretty sharp this morning, wind pretty high, and fine sunshine most of the day; hard frost this night; ther. 26 at ten.
5	35 35	30.2 30.1	N.E. Sharp.	{ Very sharp hard frost; ther. 22 at seven this morning; fine sunshine all this day, and wind sharp; a little frost this night.
6	43 35	30	N.E. Sharp.	{ Fine clear morning, with sharp frost; ther. 25 at six; fine sunshine all this day; a heavy shower at five; fine night.
7	41 35	30.1	S.E. N.W. Little.	{ Sharp frost this morning, and ther. 28 at eight; fine sunshine all this day.
8	49 44	30	N.W. S.E. High and stormy.	{ Fine morning; continued so all day, with fine sunshine; fine mild night, but dark.

Day.	Ther.	Bar.	Wind.	
9	39 38	30	N.W. S.E. High and sharp.	{ Sharp and very stormy this morning; whole day sharp, with cutting wind, and sunshine at times; very stormy this night.
10	38 33	30.2	N.E. Sharp.	{ Clear sharp morning, with hail showers at eight; sunshine at nine; sharp, with sunshine at times afterwards; some frost this night.
6 m. 11	28 39 39	30.3	E. Very sharp.	{ Pretty sharp frost this morning; ther. 28 at six; wind very sharp, and so all day, with sunshine; fine night.
12	42 40	30.3	N.E. Little.	{ Fine cloudy morning, with a little sunshine at nine; cloudy, with sunshine at times all day; fine mild night.
13	44 41	30.2	N.E. Little.	{ Very fine mild morning; continued so all day, with sunshine at times; fine night.
14	44 46	30.2	N.W. Little.	{ Very cloudy and sharp this morning; continued so all day; fine mild night.
15	35 35 10 n. 30	30.1	N.E. High.	{ Cloudy and stormy, with some rain this morning; stormy, with showers at noon; fine afternoon, with sunshine at times; fine sharp night, with a little frost; ther. 30 at ten.
7 m. 16	25 39 37	30	N.E. High.	{ Clear and sharp frost this morning; ther. 25 at seven; cloudy afterwards, with rain at four in the afternoon; fine clear night.
17	39 44	29.4	W. Little.	{ Pretty sharp this morning, with a little frost; some showers of sleet afterwards; showers of rain and sleet in the afternoon; showers at night.

Day.	Ther.	Bar.	Wind.	
18	47 42	29.1 29.3	W. Very high.	{ Fine mild morning, with a shower at nine; very stormy afterwards; fine night.
19	42 40	29.5 29.6	W N. W. High.	{ Sharp this morning, with sunshine at nine; fine sunshine all day afterwards; fine clear night.
20	48 49	29.8	W. High.	{ Fine clear morning, with a little frost; fine sunshine afterwards; fine night.
21	56 57	30 30.3	W. Little.	{ Fine mild morning, with sunshine at nine, and continued so all day; fine night.
22	52 48	30.3	S.W. Little.	{ Very fine mild morning, with fine sunshine all day; fine moonlight this night.
23	46 43	30.3	S.E. Pretty high.	{ Fine clear morning, with fine sunshine all this day; fine clear night.
24	44 40	30.3	S.E. Sharp.	{ Fine clear morning, with wind pretty sharp; fine sunshine all this day; fine night.
25	45 43	30.3	S.E. Little.	{ Very fine sunshine all this morning, and continued till noon; cloudy, with sunshine at times; fine clear moonlight night.
26	51 46	30.3	E. Little.	{ Very fine sunshine all this day, and mild; pretty dark at night.
27	44 45	30.3	S.E. Little.	{ Very fine mild cloudy morning; continued so all day, with fine sunshine; very dark at night.
28	48 44	30.1	N.E. Little.	{ Cloudy, with some rain this morning; cloudy, with sunshine afterwards; fine mild night.

Day.	Ther.	Bar.	Wind.	
29	44 42	30	N.E. Little.	{ Cloudy this morning, with some sunshine at times; fine clear night.
30	45 44	30	N.E. Little.	{ Fine cloudy morning and day, with sunshine at times; fine mild night.
31	37 44	29.7	E. Little.	{ Cloudy and pretty mild this morning, with showers of snow at times; all day afterwards pretty sharp, with showers of sonw at night.

Rain Gauge, 0 inch, 45000 parts.

APRIL, 1807.

Day.	Ther.	Bar.	Wind.	
1	40 38	29.8	E. Sharp.	{ Sharp frost this morning, and the ground white with snow; fine sunshine all day; dark at night, with frost.
2	42 40	29.8.	E. Little.	{ Pretty sharp frost this morning, ther. 24 at six; cloudy, with sunshine at times all this day; sharp clear night, with frost, ther. 29 at nine.
3	45 42	30	N.W. Little.	{ Sharp frost this morning, ther. 24 at six; cloudy with sunshine at times all day afterwards; fine mild night.
4	54 51	30	W. Little.	{ Very fine mild morning, with sunshine most of the day; fine clear night.
5	55 52	30	W. High.	{ Cloudy, and wind very sharp this morning, and continued all day, with sunshine at times; fine clear night.
6	54 52	30	W. Little.	{ Fine cloudy mild morning, and day; fine mild night.
7	58 58	30	W. Very little.	{ Fine mild cloudy morning, and day; fine mild night.
8	62 58	30.2	W. Little.	{ Fine mild morning, with fine sunshine all day; fine night, but dark.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	60 57	30.2	W. Little.	{ Very fine mild morning, with fine sunshine at nine, which continued all day; small rain at night.
10	59 64	29.7	W. High.	{ Very cloudy this morning, and frequent showers of rain; wind high, with fine sunshine in the afternoon; fine night.
11	56 56	29.4	W. High.	{ Fine and cloudy, wind high, which continued all day, with sunshine at times.
12	55 53	29.1	W. Little.	{ Frequent heavy showers of rain this morning; cloudy, with showers in the forenoon; some sun in the afternoon; fine clear night.
13	55 49	29.2	S.E. Little.	{ Fine mild morning, with sunshine at nine; cloudy, with sunshine at times all this day; fine night.
14	49 47	29.2	S.E. Sharp.	{ Cloudy sharp morning, until noon; heavy shower of rain at four; fine night.
15	42 41	29.4	E. High.	{ Very cloudy and stormy all this day, and wind high; fine night.
16	42 44	29.7	S.E. N.W. Sharp.	{ Cloudy and sharp this morning, with showers of hail; cloudy, with sunshine at times afterwards.
17	44 43	30	S.W. N.E. High.	{ Dublin mountains white with snow; sharp frost this morning; fine clear sunshine all day; wind sharp; fine clear night.
18	45 42	30	S.E. N.W. High.	{ Very cloudy stormy day, and wind very high; sharp cold night.

Day.	Ther.	Bar.	Wind.	
19	45 43	30.1	S.E. High.	{ Sharp this morning, and wind cutting; continued so all day; fine night.
20	47 43	30.1	S.E. N.W. Little.	{ Pretty sharp this morning, and cloudy; continued so all day; fine mild night.
21	43 41	30.1	S.W. Stormy.	{ Very cloudy this morning, and mild, with some rain at twelve; showers in the afternoon; fine mild night.
22	54 54	29.7	S. Pretty high.	{ Fine mild cloudy morning, with showers in the forenoon; fine mild night.
23	53 54	29.8	S. Little.	{ Cloudy mild morning, with showers at noon; fine mild night.
24	66 64	30	W. Pretty high.	{ Very mild and cloudy morning, and day; fine mild night.
25	70 65	30.1	S.W. Little.	{ Fine mild morning, with sunshine at nine, which continued all day; fine night.
26	60 58	30.2	S.W. Little.	{ Very fine mild morning, and day, with fine sunshine; fine night.
27	62 63	30.2	S.W. Little.	{ Fine mild morning, with sunshine at nine; fine sunshine all day; some small rain this night.
28	62 63	30.1	S.W. Little.	{ Fine mild cloudy day, with sunshine all day; fine mild night.
29	62 63	30.1	S.W. Little.	{ Very fine mild cloudy day, with a little sunshine at times; fine mild night.

APRIL, 1807.

Day.	Ther.	Bar.	Wind.	
30	64 64	29.8	S.W. Little.	} Very cloudy and mild morning, with some rain in the forenoon; cloudy afternoon; fine clear night.

Rain Gauge, 0 inch, 57000 parts.

MAY, 1807.

Day.	Ther.	Bar.	Wind.	
1	66 63	29.8	S.W. Little.	{ Very cloudy and mild, which continued all day; fine mild clear night.
2	59 55	29.7	S.W. Little.	{ Very fine mild cloudy morning; fine shower at four; fine night.
3	52 52	29.7	S.E. Little.	{ Some rain this morning; cloudy with sunshine this day; very fine night.
4	52 51	29.6	E. Little.	{ Cloudy mild morning, with fine sunshine; very fine night.
5	53 52	29.4	S.E. Little.	{ Fine small rain this morning; fine cloudy day afterwards; fine night.
6	59 54	29.4	E. Little.	{ Very fine mild morning, with rain, and had been rain in the night; fine cloudy day afterwards; fine mild pleasant night.
7	53 52	29.4	E. Little.	{ Very fine mild cloudy morning; continued so all day; fine night.
8	60 55	29.4	E. Little.	{ Very fine cloudy morning, and day; heavy rain at night.
9	56 53	29.3	E. Little.	{ There had been much rain in the night; cloudy and mild all this day; fine clear night; wind high.
10	57 54	29.6	S.W. N.E. Little.	{ There had been rain in the night; cloudy, with sunshine at times this day; fine night.

Day.	Ther.	Bar.	Wind.	
11	58 50	29.6	S. Sharp.	{ Fine cloudy morning, with sun- shine at nine; cloudy after- wards; very heavy rain at night.
12	53 52	29.6	S.E. Little.	{ Heavy dashing rain all the morn- ing, which continued all day; rain at night.
13	49 50	29.6	E. Little.	{ Heavy rain most of the morn- ing; cloudy after ten, with some sunshine in the after- noon; fine night.
14	57 55	29.6	E. Most calm.	{ Cloudy, with pretty heavy rain most of the morning; heavy showers at times all the day; fine clear night.
15	61 61	29.7	S.E. N.W. Little.	{ Fine mild morning, with some sunshine; showers at times all day; fine night.
16	63 62	29.7	W. Little.	{ Fine mild cloudy morning, with sunshine till noon; heavy shower at one; heavy show- ers of rain this night.
17	66 66	30.1	S.W. Little.	{ Fine clear morning, with fine sunshine all day; fine night.
18	57 56	30.3	S.W. Little.	{ Fine clear sunshine this morn- ing, and continued all day; fine mild night.
19	58 55	30.4	E. Little.	{ Fine clear sunshine this morn- ing, and continued all day; fine night.
20	55 52	30.3	E. Little.	{ Very fine clear sunshine this morning, and continued all day; fine night.
21	59 59	30.1	E. Little.	{ Fine clear morning, and day, with very fine sunshine; fine night.
22	55 55	30.3	E. Little.	{ Very fine mild morning, with fine sunshine all day; very fine mild night.

Day.	Ther.	Bar.	Wind.	
23	69 63	30.3	E. Little.	{ Very fine clear day, with sun- shine all day; fine mild night.
24	73 70	30.3	S.E. Little.	{ Very fine clear morning, with sunshine all day; fine mild night.
25	72 69	29.8	E. Little.	{ Very fine clear morning, with fine sunshine all day; fine mild night.
26	59 57	30	S.E. N.W. Little.	{ Fine cloudy mild morning, with small rain all day; fine night.
27	63 59	30	W. Little.	{ Fine morning, with sunshine at nine; cloudy, with showers of rain; heavy shower at two; another at five, with a rain- bow; fine mild night.
28	59 52	30	N.E. Little.	{ Fine morning, with sunshine at nine; heavy shower of hail in the forenoon, with thun- der; showers of hail in the afternoon, with thunder; fine night.
29	58 52	30.2	N.E. Sharp.	{ Rain this morning, with showers of hail in the forenoon; sun in the afternoon; fine night.
30	52 52	30.2	N.E. Sharp.	{ Very fine clear day, with fine sunshine; fine sharp night.
31	55 55	30.2	N.E. Little.	{ Fine cloudy morning, with wind pretty sharp; fine night.

Rain Gauge 3 inches, 45000 parts.

JUNE, 1807.

Day.	Ther.	Bar.	Wind.	
1	52 52	30.2	E. Little.	{ Fine cloudy morning, and wind sharp; fine mild night, with some rain.
2	57 53	30	N.E. Little.	{ Fine mild cloudy morning; continued so all day; fine night.
3	61 61	30.1	N.E. Little.	{ Fine clear morning, with fine sunshine all day; close fog this night.
4	65 66	30.1	S.E. N.W. Little.	{ Fine cloudy morning, with fine sunshine at noon; sun at times in the afternoon; fine night.
5	67 65	30	N.W. Little.	{ Very fine mild morning, with a little sun at noon; fine mild night, with small rain.
6	62 61	29.8	N.E. Little.	{ Very fine clear day, with fine sunshine all day; fine night.
7	60 59	29.8	N.W. Little.	{ Fine clear morning; continued so all day, with fine sunshine; fine night.
8	56 54	29.6	N.W. Little.	{ Cloudy this morning, with some rain at noon; sharp night.
9	59 56	29.6	S.E. N.W. Very high.	{ Fine clear sharp morning, and stormy; wind high; very sharp night.
10	61 59	29.7	S.E. Little.	{ Fine cloudy morning; rain at four; some rain this night.

Day.	Ther.	Bar.	Wind.	
11	50 50	30	S.E. N.W. Little.	{ Fine cloudy morning, with close small rain after ten, till night.
12	64 63	30.1 30.3	S.E. N.W. Little.	{ Fine cloudy morning, with some sunshine at times all day; fine night.
13	68 64	30.3	W.N. W. Little.	{ Fine cloudy mild day; fine night, but wind sharp.
14	69 66	30.1	S.W. Sharp.	{ Very fine clear morning, and day, with sun at times; fine clear night.
15	62 63	30	S.W. N.E. Little.	{ Fine cloudy morning, with sun- shine at times all day; fine mild night.
16	63 64	29.8	W. Little.	{ Fine cloudy morning, with some sunshine at nine; showers of rain at times in the day; fine night.
17	60 64	30.2	W. Little.	{ Fine mild morning, with showers at times in the day; fine mild night.
18	66 64	30.3	W. Little.	{ Fine cloudy mild morning, with sunshine in the forenoon; pretty sharp this night.
19	70 66	30.3	W. Little.	{ Very fine clear day, with sunshine all day; fine sharp night.
	64 64	30.3	W. Little.	{ Mild morning, with showers of rain, which continued till noon; sunshine in the after- noon; fine night.
21	67 65	30.4	W. Little.	{ Fine mild cloudy morning, with sunshine in the forenoon, which continued all day; fine mild night.
22	70 70	30.4	W. Little.	{ Fine mild morning, with sun- shine most of the day; fine mild night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
23	66 64	30.3	W. Little.	{ Very fine mild cloudy day; mild warm night.
24	69 64	30.1	S.E. N.W. Little.	{ Fine mild warm cloudy day; heavy rain at night.
25	66 63	30.1	S.E. Little.	{ Fine mild cloudy day, with some sunshine at times; fine night.
26	69 66	30.1	W. Little.	{ Very fine mild cloudy day, with fine sunshine at times; fine mild night.
27	63 62	30.1	W. Little.	{ Fine warm morning, with a little sunshine; some rain at mid-day; fine night.
28	73 66	30.1	S.E. Little.	{ Very fine clear morning, with fine sunshine all day; fine night.
29	69 66	30.1	N.W. Little.	{ Very fine mild cloudy day, with sunshine at times; fine night.
30	67 66	30.1	N.W. Little.	{ Fine mild cloudy morning, and day, with some sun at times; fine night.

Rain Gauge 1 inch, 35000 parts.

JULY, 1807.

Day.	Ther.	Bar.	Wind.	
1	68 67	30.1	N.E. Little.	{ Fine mild cloudy day, with some sunshine at times; pretty sharp this night.
2	64 63	30	S.E. N.W. Little.	{ Very fine clear day, with fine sunshine all day; fine night.
3	70 68	30	N. Sharp.	{ Very fine mild warm morning, with fine clear sunshine; pret- ty sharp this night.
4	69 66	30.1	N. Little.	{ Fine cloudy morning, with some sunshine at nine, which continued most of the day; fine night.
5	66 61	29.2	N.E. Little.	{ Fine clear day, with sun- shine all day; fine mild night.
6	63 63	30.2	S.E. Little.	{ Very fine clear day, with sun- shine all day; mild cloudy night.
7	67 63	30.3	N.E. Little.	{ Very fine clear day, with sun- shine; fine mild night.
8	67 65	30.3	S.E. Little.	{ Fine cloudy morning, with sun- shine at ten; sunshine all day afterwards; fine night.
9	75 75	30.3	E. Little.	{ Very fine clear morning, with sunshine all day; fine warm night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
10	70 63	30.2	S.E. N.W. Little.	{ Very fine clear day, with sun- shine; fine mild night.
11	62 62	29.7	S.E. Little.	{ Very fine sunshine this morning till ten; showers of rain at times afterwards; some rain this night.
12	74 68	29.6	S.E. Little.	{ Very fine mild cloudy day, with frequent showers of rain; cloudy this night, with rain.
13	71 66	29.6	S. Little.	{ Very fine mild morning, with some sunshine at nine; cloudy afterwards; some rain this night.
14	73 63	29.8	S.W. Little.	{ Fine warm mild cloudy morning; continued so all day; fine night.
15	70 68	30	W. Little.	{ Fine mild morning, with some rain; cloudy all day after- wards; fine night.
16	68 68	30.	W. Little.	{ Very mild this morning, with a little rain at nine; cloudy, with showers afterwards; fine mild night.
17	70 68	30	W. Little.	{ Very fine mild morning, with sunshine all day; fine clear night.
18	69 68	30	W. Little.	{ Very fine mild cloudy morning, and day; fine warm night.
19	70 66	29.8	S.E. Little.	{ Cloudy mild morning, with some rain at times after ten; mild, with rain at night.
20	70 68	29.8	S.E. Little.	{ Fine cloudy day, with clear moonlight at night.

Day.	Ther.	Bar.	Wind.	
21	68 69	30	W. Little.	{ Fine cloudy mild morning, with some sunshine in the forenoon; fine night.
22	69 67	30	E. Little.	{ Very mild warm morning and day; mild night, with thunder.
23	68 65	29.6	S.E. N.W. Little.	{ The most dreadful storm of thunder and lightning, that the oldest man in the country ever heard, last night, with heavy rain; cloudy day, with sunshine at times; fine night.
24	68 63	29.7	S.E. N.W. Little.	{ Fine mild morning, and day; fine mild night.
25	62 69	29.8	S.W. Little.	{ Very cloudy this morning, with dashing rain most of the morning; wind high all this day, and stormy; fine mild night.
26	60 61	29.7	S.W. Little.	{ Very fine this day, with showers and sunshine at times all day; fine clear night.
27	59 68	29.8	S.E. N.W. Little.	{ Cloudy mild morning, with heavy showers of rain in the forenoon; thunder showers and sunshine at times in the afternoon; fine night.
28	66 64	30	S.E. N.W. Little.	{ Fine mild morning, with showers at times all day after ten; rain at night.
29	70 68	30	W. Little.	{ Fine clear warm day, with sunshine; fine mild night.
30	68 63	29.7	W. Little.	{ Very cloudy, with showers at times all this day, and thunder with some sunshine; fine night.

JULY, 1807.

Day.	Ther.	Bar.	Wind.
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31

70
69

29.7

S.E.
Little.{ Very fine clear warm morning,
with sunshine all day; fine
night.

Rain Gauge 1 inch, 33000 parts.

AUGUST, 1807.

Day.	Ther.	Bar.	Wind.	
1	70 62	29.7	S.E. N.W. High.	{ Cloudy mild morning; some rain this afternoon, with a great quantity of thunder; fine mild night.
2	65 66	29.8	S.W. Little.	{ Fine cloudy morning, with show- ers at twelve; showers at times afterwards, and at night.
3	67 66	29.8	W. Little.	{ Fine mild cloudy morning, with showers at noon; fine night.
4	61 60	29.8	W. Little.	{ Fine cloudy mild day, with sun- shine at times; some rain at night.
5	68 65	29.8	W. Little.	{ Cloudy mild morning; conti- nued so all day, with heavy showers at three in the after- noon; fine mild night.
6	68 66	29.8	W. Little.	{ Fine mild morning, with show- ers at noon; showers in the afternoon; mild cloudy night.
7	70 64	30	W. Little.	{ Fine mild cloudy morning, with some sunshine at noon; show- ers at four; close fog this night.
8	64 65	30	S.W. Little.	{ Cloudy this morning, with show- ers at noon; fine clear sun- shine afternoon; fine night.
9	67 62	30	S.E. N.W. Little.	{ Fine mild cloudy morning, with fine sunshine at times, which continued all day; fine mild night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
10	62 63	30	S. Little.	{ Fine mild morning, with sun- shine all day after ten; fine night.
11	58 58	29.8	S. Little.	{ Cloudy sharp morning till ten; frequent heavy showers at times all day after, with rain at night.
12	69 70	29.5	S. Little.	{ Very fine cloudy morning, and day, with sunshine at times; fine mild night.
13	65 65	29.6	S.E. High.	{ Heavy rain all last night, and continued till eight, with sun- shine afterwards; fine mild night.
14	70 69	29.7	S.E. N.W. Little.	{ Very warm this day, with some rain at noon; fine afternoon and night.
15	72 69	30	S.W. Little.	{ Very fine mild warm morning, and cloudy; continued so all day; fine night.
16	75 72	30.2	S.W. Little.	{ Very fine warm clear day, with sunshine all day; fine mild night.
17	74 72	30.2	W. Little.	{ Very fine mild warm day, with clear sunshine; fine night.
18	74 72	30.1	W. Little.	{ Mild cloudy morning, with fine sunshine after ten; fine night.
19	73 72	29.8	S.E. Little.	{ Fine mild cloudy morning, with clear sunshine after ten; fine mild night.
20	66 67	29.8	S.E. Little.	{ Very mild cloudy day; fine mild night.
21	66 63	29.7	S.E. Little.	{ Fine cloudy mild morning, with showers in the afternoon; close small rain this night.
22	70 69	29.7	S.E. Little.	{ Very fine clear warm day, with sunshine; fine mild night.

Day.	Ther.	Bar.	Wind.	
23	70 69	29.6	S.W. Little.	{ Fine cloudy mild morning; warm showers and thunder in the afternoon; very heavy rain at night.
24	67 66	29.6	S.W. Little.	{ Cloudy mild morning, with a heavy shower at noon; fine mild night.
25	67 63	29.7	S.W. Little.	{ Fine cloudy mild morning, and day; very fine mild night.
26	69 69	29.8	W.S. W. High.	{ Fine mild cloudy morning, with wind sharp after ten; fine mild night, with showers.
27	75 72	29.8 29.5	W. Little.	{ Mild cloudy morning; there had been much rain in the night; cloudy, with sun at times; fine night.
28	65 63	29.6	W. Pretty high.	{ Mild cloudy morning; there had been rain in the night; cloudy with sunshine at times afterwards; fine night.
29	66 62	29.7	W. Little.	{ Very fine warm morning, and fine sunshine at nine; very heavy rain in the afternoon; fine night.
30	61 58	29.8	W. Pretty high.	{ Fine cloudy morning, with sunshine at times all day; fine sharp night.
31	64 62	30.1	W. Little.	{ There had been rain in the night; fine day, and cloudy with sunshine at times; fine night.

Rain Gauge 1 inch, 83000 parts.

SEPTEMBER, 1807.

Day.	Ther.	Bar.	Wind.	
1	64 62	30.2	W. Little.	{ Mild this morning, with some rain; fine cloudy day afterwards; fine night.
2	66 64	30.1	W. Little.	{ Fine clear day, with sunshine all day; fine night.
3	65 64	30.1	S.W. Little.	{ Fine clear morning and mild; some rain in the afternoon at five; heavy showers at night.
4	62 58	29.8	S.W. N.E. Little.	{ Mild cloudy morning, with showers at times all day after ten; rain at night.
5	58 53	29.4 29.2	N. High.	{ There had been much rain in the night, with heavy rain all the morning, which continued all day; heavy rain at night, with a great flood in the river.
6	52 53	29.5	N. High.	{ Dashing rain this morning, with a high flood in the river; showers, with sunshine at times all day; fine night.
7	55 53	29.6	N. High.	{ Fine clear morning, with showers of rain at noon; fine sharp afternoon; clear sharp night.
8	59 55	30 29.6	W. Sharp.	{ Fine sharp clear morning, with showers at noon; some sunshine, and wind sharp; rain at night.

SEPTEMBER, 1807.

77

Day.	Ther.	Bar.	Wind.	
9	55 51	29.4 29.5	S.E. N.W. Little.	{ Heavy close rain all this day; fine clear night.
10	54 55	29.7	N.W. Little.	{ Fine clear morning, with a shower at noon; fine sunshine in the afternoon; fine night.
11	57 55	30.1	N.W. Little.	{ Very fine clear sunshine most of this day; fine sharp night.
12	54 51	29.8	S.E. N.W. Little.	{ Clear sharp morning, with a little white frost; fine clear sharp day, with sunshine at times; clear sharp night.
13	55 52	30	N.E. Little.	{ Fine clear sunshine this morn- ing, and continued so all day; fine sharp clear night.
14	55 53	30	N.W. Little.	{ Fine clear sharp morning, and a shower at noon; clear sun- shine in the afternoon; fine clear sharp night.
15	57 53	30	N.W. Little.	{ Very fine clear day, with sun- shine all day; fine moon- light night.
16	57 54	30	N.W. Little.	{ Very fine clear morning, with sunshine all day; fine sharp night.
17	55 52	30	S.E. N.W. Little.	{ Fine clear morning, with sun- shine all day; fine clear sharp night.
18	57 53	30	S.E. N.W. Little.	{ Fine clear morning, with clear sunshine all day; fine mild night.
19	56 52	30	N.E. Little.	{ Very fine clear morning, with sunshine which continued all day; mild night, with close fog.
20	62 57	29.8	N. Sharp.	{ Very cloudy; there had been rain in the night; fine and cloudy, with sunshine at times; fine mild night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
21	61 57	29.8	W. High.	{ Fine cloudy morning; with sun- shine at times all day; fine night and dark.
22	61 52	29.4	W. High.	{ Cloudy mild morning; continued so till noon; rain in the after- noon, with wind high; stormy night, with rain.
23	57 56	29.5	S.E. N.W. High.	{ Heavy dashing rain this morn- ing till nine; clear sun- shine afterwards, and wind high; fine sharp night.
24	57 53	29.4	W. Little.	{ Very fine clear sunshine all this day; fine mild night.
25	57 55	29.4	W. Little.	{ Fine mild cloudy morning, and day; mild night, with showers.
26	60 59	29.3	W. Little.	{ Very fine mild cloudy morning, and day; fine mild night.
27	60 57	29.3	W. Little.	{ Fine cloudy morning, and day; with sunshine at times; fine night.
28	62 59	29.3	W. Little.	{ Very fine clear morning, with sunshine all day; fine clear night.
29	59 53	29.6	W. Little.	{ Dashing rain this morning; cloudy forenoon; rain in the afternoon; rain at night.
30	58 54	30	W. Little.	{ Very fine clear day, with sun- shine all day; clear sharp night.

Rain Gauge, 7 inches, 3,32000 parts.

OCTOBER, 1807.

Day.	Ther.	Bar.	Wind.	
1	53 59	30	W. Little.	{ There had been rain in the night; fine cloudy morning; heavy dashing in the forenoon, with rain in the afternoon; rain at night.
2	58 57	30	W. Little.	{ Cloudy, with rain this morning; some rain at times in the day; fine night.
3	65 60	29.8	W. Little.	{ Fine cloudy mild day; fine mild night.
4	69 64	29.8	W. Little.	{ Very mild cloudy morning, and day, with sun in the afternoon; rain at night.
5	68 62	29.8	W. Little.	{ Fine cloudy morning, and very mild all day; heavy rain at night.
6	65 60	29.8	W. Little.	{ Very fine mild cloudy day; fine night, with moonlight.
7	60 58	29.7	W. Little.	{ There had been rain in the night; fine mild cloudy day; heavy rain at night.
8	57 54	29.8	W. Little.	{ Cloudy, with some showers this morning; fine cloudy day; fine night.
9	55 53	30	S. Little.	{ Fine mild morning, with some rain in the forenoon; showers in the afternoon; rain at night.
10	60 58	30	W. Little.	{ Cloudy mild morning, with some rain; cloudy afterwards; fine mild night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
11	64 62	29.8	W. Little.	{ Fine clear sharp day, with fine sunshine; fine clear night.
12	57 59	29.8	W. Little.	{ Heavy rain this morning; cloudy with showers at times all day; close fog this night.
13	66 60	29.8	W. Little.	{ Cloudy, with some small rain this morning; fine mild day afterwards; mild clear night.
14	61 60	30	S.W. Little.	{ Very fine mild morning, with sunshine all day; fine clear night.
15	60 58	30	S.W. Little.	{ Very fine clear morning, with sunshine all day; fine mild night.
16	60 57	30	S.W. N.E. Little.	{ Mild cloudy day, with sunshine at times; fine mild night.
17	58 58	29.7 29.6	S.E. N.W. Little.	{ Cloudy with rain this morning; heavy showers of rain at times afterwards; fine night.
18	55 53	29.8	W. Little.	{ Very fine clear morning, with sunshine most of the day; fine mild night.
19	58 56	30.1	W. Little.	{ Fine clear morning, with sun- shine all day; fine clear night.
20	56 54	29.7 29.5	W. Little.	{ Fine cloudy morning, with hea- vy showers in the day after- wards; heavy rain at night.
21	54 48	29.2	S.E. N.W. High.	{ Heavy dashing rain all the morn- ing, with showers at times all day afterwards; rain at night.
22	54 47	29.4	S.W. N.E. Little.	{ Very cloudy all this day, with rain at times; heavy showers at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
23	44 43	29.4	W. Pretty high.	{ Cloudy and wind very sharp; some rain in the afternoon; fine clear night.
24	47 48	29.2	W. Little.	{ Cloudy mild morning with some rain at noon; fine clear night.
25	50 48	29.4	S.E. Little.	{ Fine clear morning, with sun- shine; cloudy in the fore- noon; some rain in the after- noon; fine night.
26	52 49	29.7	S.E. Little.	{ Fine clear morning, with fine sunshine all day; fine mild night.
27	46 44	29.2	S.E. Little.	{ Fine cloudy morning, with rain in the forenoon; fine after- wards; fine sharp night.
28	47 43	29.8	W. Little.	{ Very fine clear morning, with sunshine all day; fine clear night.
29	52 49	29.7	W. Little.	{ Very fine cloudy morning, and mild all day; fine night.
30	52 50	29.6	W. Little.	{ Very cloudy; some rain at times, which continued all day; fine night.
31	53 50	29.6	W. Little.	{ Very fine mild cloudy day; fine mild night.

Rain Gauge 2 inches, 998000 parts.

NOVEMBER, 1807.

Day.	Ther.	Bar.	Wind.	
1	54 48	29.4	W. Little.	{ Fine morning; cloudy, and rain from twelve till two; fine afterwards; stars bright at night.
2	49 47	29.6	W. High.	{ Fine sharp morning; sun very red till nine; cloudy, and driven rain from ten till night; dark, with heavy showers at times.
3	44 42	29.2	N.N. W. Very high.	{ Heavy driving rain till noon; sunshine and showers of rain; sleet in the afternoon; stars bright at night.
4	45 43	29.6	W. Little.	{ Fine morning; sunshine continued most part of the day; night fine; moon and stars bright at nine.
5	52 46	29.4	N. Brisk.	{ Fine morning; rain about eight; cold, and frequent showers in the afternoon; stars and moonlight at night.
6	47 45	29.4	W. Pretty high.	{ Cold this morning; sunshine and very clear till noon; cloudy, with sunshine at times; cloudy night.
7	44 40	29.2	N.W. Little.	{ Fine morning; sunshine and showers about one; cloudy afternoon; fine night.

Day.	Ther.	Bar.	Wind.	
8	40 36	29	W. Pretty high.	{ Sharp frost in the morning, with fine sunshine most of the forenoon; cloudy in the afternoon; fine clear moonlight at night, with sharp frost.
9	38 37	29.3	W. Little.	{ Sharp frost this morning; cloudy afterwards; fine moonlight night.
10	38 38	29.3 29.4	E. Little.	{ Stormy, with hail, rain, and sleet this morning, with heavy showers of hail at times in the forenoon; heavy showers of hail afterwards; little at night.
11	38 36	29.7	N.E. Little.	{ Pretty sharp this morning; ther. 31 at seven; clear sunshine; Dublin mountains white with snow; fine moonlight at night.
12	37 36	30	W. Little.	{ Very fine clear sunshine; sharp frost in the night; ther. 29 at seven; Dublin mountains white with snow; fine night.
13	38 39	30.2	N. Little.	{ Very fine sunshine this morning; some rain at night.
14	39 39	30.1	N.E. Little.	{ Very cloudy and pretty mild, with some rain at one; fine clear mild night.
15	38 40	30.1	N.E. Little.	{ Very stormy this day, with frequent showers of rain most of the day; fine night.
16	44 43	30	S.W. Little.	{ Blustery morning, with some rain; cloudy and mild for the remainder of the day; mild night.
17	40 39	30 29.8	N.W. Sharp.	{ Fine mild cloudy morning; continued so all day; clear stars at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
18	37	29.7	N.W.	{ Fine mild morning, and very cloudy till one; sharp afterwards; freezing fast at seven, ther. 29; ther. 31 at ten.
7 n.	32		Sharp.	
	29			
19	38	29.2	N.E.	{ Stormy sharp morning; some sunshine, with snow on the ground, and wind sharp; driving snow, which lasted all the evening; ther. 30 at seven, wind very high.
	32	29.1	Very high.	
20	32	29.2	S.E.	{ Clear morning and sharp; there had been much snow in the night; about six inches depth of snow; some sunshine in the forenoon; fine clear night.
	32		N.W. Pretty high.	
7 m.	29			{ Fine clear sharp morning; ther. 29 at seven; sharp frost at night; ther. 24 at eleven this night.
21	39	29.4	S.E.	
	29		N.W.	{ Clear sharp morning; ther. 24 at eight; snow all on the ground; fine clear night.
11 n.	24		Little.	
8 m.	24		N.W.	{ Cloudy day, and wind pretty sharp; some of the snow gone; clear afternoon, and freezing fast at four; clear sharp frost this night.
22	35	29.3	S.E.	
	36		Little.	{ Cloudy, and rather mild at noon; freezing at night; clear starlight night.
23	33	29.3	N.W.	
	31		Little.	{ Cloudy, with some rain at nine this morning; clear towards night; sharp frost; ther. 30 at ten; fine starlight night.
24	36	29.2	S.E.	
	35		N.W. Little.	{ Pretty sharp frost, with clear sunshine at times this day; clear night with frost; wind pretty high; fine starlight night.
25	37	29.2	W.	
	35	29.4	Little.	{
26	35	29.5	N.W.	
	31		Little.	

NOVEMBER, 1807.

85

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
27	35	29.6	N.W.	{ Sharp frost this morning ; snow had fallen in the night ; pretty clear sunshine most of this day ; freezing sharp at night ; ther. 26 ; clear stars this night.
	36		Sharp.	
10 n.	26			
28	35	29.6	N.W.	{ Mild morning, and very cloudy ; mild all the forenoon ; pretty sharp in the afternoon ; freez- ing sharp in the evening ; ther. 25 at ten this night.
	33		Sharp.	
7 n.	25			
29	38	29.7	W.	{ Fine clear morning, with sharp white frost ; mild most of the day afterwards ; freezing fast at night ; ther. 23 at ten this night.
	29		Little.	
30	37	29.8	N.W.	{ Sharp white frost this morning ; pretty mild at noon ; clear night, with sharp frost ; ther 29 at ten this night.
	36		Sharp.	
10 n.	29			

Rain Gauge 1 inch, 75,000 parts.

DECEMBER, 1807.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
1	37 37	28.8	W. Little.	{ Pretty mild this morning, and continued all day ; some small rain at night.
2	41 40	29.7	W. High.	{ Fine mild morning, and cloudy till one, with some small rain at times, and the snow going very fast awy ; fine mild night.
3	42 42	30	W. High.	{ Fine mild morning, and cloudy all day ; fine night, but very dark.
4	45 44	29.7	W. Little.	{ Fine mild cloudy moring ; very cloudy towards afternoon, with some showers at times ; fine clear moonlight at night.
5	45 43	29.5 29.4	W. Pretty high.	{ Cloudy morning, with sunshine after ten ; clear and fine till noon ; some showers afterwards ; fine clear moonlight at night.
6	38 37	29.4	N.W. Brisk.	{ There had been some rain in the night ; fine clear sunshine this day ; a little frost at night.
7 10 n.	30 27 22	29.5 29.7	S.E. Pretty high	{ Fine clear morning, with a little frost ; began snowing at nine, and continued till one ; ground covered ; clear afternoon, and sharp frost ; clear moonlight, ther. 22. at ten this night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
8 m. 23				Clear sharp frost this morning, ther. 23 at eight; fine clear sunshine till twelve; sharp frost this night; clear moon- light, ther. 17 at twelve this night.
8	27	29.8	N.	
	25		Sharp.	
12 n. 17				
7 m. 21				Clear morning, with sharp frost, ther. 21 at seven; clear sun- shine till noon; cloudy after- wards; sharp frost at night, ther. 28 at ten.
9	30	39.1	N.	
	25		Sharp.	
10 n. 28				
10	40	30	W.	Pretty mild this morning, and snow almost gone; close fog to- day; some little rain at times; fine night
	40		Little.	
11	44	30.1	W.	Very fine mild morning; con- tinued so till noon; some rain in the afternoon; some show- ers at night.
	43		Little.	
12	43	30.1	W.	Mild and uncommonly cloudy all day; some rain at four; fine night.
	43		Little.	
13	44	30.2	W.	Fine clear morning, with a little white frost and some sunshine; cloudy afterwards; some rain at night.
	48		Little.	
14	44	30.2	W.	Clear morning, with a little white frost, and fine sunshine; clou- dy at times; fine night.
	40		Little.	
15	44	30	W.	Mild and cloudy this day; fine pleasant night.
	43		Little.	
16	44	30	W.	Very mild this morning; fine sunshine after ten till noon; cloudy afternoon; fine night.
	43		Little.	
17	43	29.8	W.	Mild and cloudy in the forepart of this day; fine sunshine afternoon; mild night.
	40		Pretty high.	

<i>Day</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
18	45 40	29.8	W. Little.	{ Fine mild morning, and cloudy with sunshine at times; fine mild night, with clear moonlight.
19	40 36	29.8	S.W. N.E. Little.	{ Cloudy mild morning, with fine sunshine after ten till noon; cloudy afternoon, fine night.
20	49 40	30	S.W. Little.	{ Fine clear sunshine this morning, and mild; very cloudy after ten; fine night.
21	41 37	30.2	W. Little.	{ Close fog this morning, and continued all day; very mild; a little sharp at night.
22	33 33	30.1	S.W. Most calm.	{ Very close fog this morning, with a little frost; close fog all day; pretty sharp at night.
23	34 32 10 n. 30	30	S.W. Most calm.	{ Close fog this morning, and continued so all day; pretty sharp frost this night, ther. 30 at ten.
24	35 42	30	W. Little.	{ A little frost this morning, and cloudy, with fine sunshine afterwards; fine clear night; wind a little sharp.
25	52 53	29.6	W. Little.	{ Very mild this morning, and cloudy, with some rain at nine; fine day afterwards; fine clear night.
26	45 43	29.6	W. Little.	{ Clear morning, and a little sharp; constant rain from eleven till noon; fine cloudy night afterwards.
27	40 37	29.6	W. Little.	{ A little sharp this morning, with some rain at times in the forenoon; fine clear night.
28	45 42	29.2	W. Very high.	{ Very mild this morning, with wind very high last night; heavy showers at noon; fine clear night; wind high.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
29	37 34	29 29.3	N.W. Little.	{ Cloudy, and heavy rain all this morning till one; came on snow at that time, and continued till four; fine clear night.
30	35 35	29.4	N.W. High.	
31	49 41	29.2 29	W. Pretty high.	{ Fine mild morning, and snow almost gone; cloudy, with showers till one; very stormy afterwards; wind high, and dashing rain.

Rain Gauge 1 inch, 78000 parts.

Total 26 inches, 50000 parts.

DIARY OF THE WEATHER.

Ther. Thermometer, is noted at noon, and four o'clock, and occasionally
at other times. Bar. Barometer.

JANUARY, 1808.

Day.	Ther.	Bar.	Wind.	
1	42 42	28.8	S.W. Little.	{ Fine mild cloudy morning; continued so all day; very dark at night, with heavy rain.
2	37 33	28.8	W. Little.	{ Fine clear sharp morning; fine sunshine till noon; cloudy afternoon; pretty sharp frost at night.
3	37 36	29.2	W. Little.	{ Pretty sharp this morning, with fine sunshine till noon; cloudy afterwards; sharp at night; fine night.
8 m. 29				
4	39 42	29.7 29.5	W. Little.	{ Pretty sharp frost this morning, ther. 29 at eight; very cloudy, with rain at noon, which continued at times all day; fine mild night.
5	45 44	29.6 29.8	W. Little.	{ Fine mild morning, with showers at times in the forenoon; fine mild night.

Day.	Ther.	Bar.	Wind.	
6	50 49	30.1	W. Little.	{ Fine mild morning, with show- ers at times all day; fine mild night.
7	52 51	30.3	W. Little.	{ Very fine mild cloudy morning, with some sunshine at noon; fine night.
8	53 53	30.3	W. Pretty high.	{ Fine mild morning and day, with some sunshine at times; fine night.
9	49 47	30.3	W. Little.	{ Fine mild cloudy morning; very cloudy fore-noon; fine mild night.
10	48 49	30.3	W. Little.	{ Cloudy mild morning. and some small rain: cloudy all day; fine mild night.
11	47 45	30	W. Little.	{ Very mild this morning; some small rain, continued all day; fine night.
12	41 41	30	W. Little.	{ Pretty sharp this morning, and very cloudy all day; mild towards night; fine night.
13	47 41	29.7 29.6	N.W. Little.	{ Fine mild morning; there had been some rain in the night; very cloudy, with showers all day at times, and sun at times; fine mild night.
14	42 36	29.2	W. Very high.	{ Very stormy this morning, and wind exceeding high all night, and continued till noon; fine sunshine at that time; most calm at night, with a little frost.
7 m. 29 15 36 32 9 n. 23	30.2	N. Little.	{ Fine clear morning, with some frost, ther. 29 at seven; clear sunshine all day; very sharp frost at night; ther. 23 at nine.	

Day. Ther. Bar. Wind.

16	39 38	39 30.2	W. Little.	{ Frost mostly gone this morning ; a little snow on the ground, but gone by ten ; fine sun- shine all day ; fine clear moonlight at night.
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17	37 34	30.4	N.W. Little.	{ Fine clear morning, with sunshine, and a little frost ; pretty sharp frost at night ; ther. 29 at ten.
10 n.	29			

18	39 39	30.4	W. Little.	{ Pretty sharp white frost this morning ; cloudy in the day, with some rain at times ; fine mild night.
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19	45 44	30.1	W. Sharp.	{ Cloudy mild morning, with close small rain, and cloudy most of the day ; some showers at night.
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20	36 32	29.8 29.7	N.W. Little.	{ Clear sharp morning, with fine sunshine ; pretty sharp wind all day ; sharp frost at night, with some snow ; ther. 23 at twelve this night.
12 n.	23			

8 m.	22			{ Sharp frost this morning, with a little snow on the ground ; ther. 22 at eight ; fine sunshine most of the day ; freezing sharp at night ; ther. 22 at eight, but much milder at ten ; ther. 26.
21	29 25	30.1	N.W.	
10 n.	26			

22	42 40	30	W. Little.	{ Fine morning, and a little frost ; ther. 31 at seven ; cloudy with some rain afterwards ; fine mild night.
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23	47 41	29.7	W. Little.	{ Fine mild cloudy day, with some small rain at times ; fine in the afternoon ; fine mild night.
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24	46 41	29.5	W. Little.	{ Fine clear mild morning, with fine sunshine at nine ; cloudy afterwards, and pretty sharp at night.
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<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
25	33	29.3	W.	{ Pretty sharp frost this morning ; ther. 31 at seven ; a heavy shower of snow at twelve ; fine sun at one ; sharp frost at night ; ther. 27 at ten.
	31		Sharp.	
10 n.	27			
7 m	27			{ Pretty sharp frost this morning ; ther. 27 at seven ; clear sun- shine at times this day ; some snow on the ground ; pretty sharp frost at night ; ther. 27 at eleven.
26	33	29.3	N.W.	
	31		Sharp.	
27	42	29.3	W.	{ Very cloudy this morning ; small rain and snow most of this morning ; turned to rain at ten, and wind very high.
	47		High.	
28	40	29.4	W.	{ Stormy morning, with showers of rain at times ; wind pretty sharp all day ; fine night.
	38		High.	
29	42	29.6	W.	{ Pretty sharp this morning, with fine sunshine, and wind rather high ; mild at night.
	41		High.	
30	50	29.4	W.	{ Fine cloudy mild day, with a little rain at times ; fine mild night.
	51		Pretty high.	
31	47	29.4	S.W.	{ Fine mild morning, with some sunshine ; wind pretty high ; fine mild night.
	48		High.	

Rain Gauge 0 inch, 6,74000 parts.

FEBRUARY, 1808.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
1	50 47	29.3	S.W. Little.	{ Fine morning, with some sun- shine ; cloudy, with rain most of the day after ten ; fine mild night.
2	44 40	29.3 29.4	N.W. Pretty sharp.	
3	39 40	29.6 30	W. Pretty high.	{ Sharp this morning, with fine clear sunshine till ten ; cloudy afterwards, and rain ; fine night, with a little frost.
4	43 46	30.2	W. Pretty high.	
5	47 41	30 29.7	W. High.	{ Fine mild morning, and conti- nued so all the forenoon, with sunshine ; heavy shower at three ; fine afterwards ; fine night.
6	50 48	29.6	W. Pretty high.	

There had been rain in the night ; mild morning, with showers ; very stormy after ten, with frequent showers of rain, and sunshine at times ; fine moonlight night.

Day.	Ther.	Bar.	Wind.	
7	40 41	29.6	N.W. Little.	{ Pretty sharp this morning, with a little sunshine at eight; cloudy afterwards, with a heavy shower of hail at noon; some rain afterwards; fine mild night.
8	38 35 10 n. 28	29.7	N.W. Little.	{ A little frost this morning, with sunshine till ten; showers of snow at times; sharp frost at night; ther. 28 at ten.
9	37 36	29.8 30	N.W. Little.	{ A little frost this morning; fine sunshine till noon; pretty sharp in the afternoon; frost at night.
10	35 33	30.1	N.W. Little.	{ A little frost this morning, with sunshine at nine; heavy showers of snow at eleven; fine sunshine most of the day afterwards; frost at night.
11	42 38	29.3	S.W. N.W. Pretty high.	{ Cloudy this morning, and began raining at ten; continued so all day; very stormy at night, with snow; pretty sharp frost at night, and ground covered with snow.
12	31 28 10 n. 24	29.4 30	N. Sharp.	{ Pretty sharp frost this morning; ground white with snow; sharp frost all this day, with fine sunshine; sharp frost at night; ther. 24 at ten.
7 m. 23 13 31 28 10 n. 23	23 31 28 23	30	W. Little.	{ Sharp frost this morning; ther. 23 at seven; ground white with snow; sunshine most of the day; sharp frost at night, ther. 23 at ten.
14	33 34 10 n. 29	30.1	S.W. Little.	{ Sharp frost this morning, with a heavy fall of snow, which continued most of the day; a little frost this night; ther. 29 at ten.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
15	42 42	30	S.W. Little.	{ Very fine mild morning, and frost all gone; cloudy all day, and mild, with some rain; fine mild night.
16	47 47	30	S.W. Little.	{ Fine mild cloudy morning, with close small rain most of the day; fine mild night.
17	47 46	30	W. Little.	{ Cloudy mild morning, with some rain; fine night.
18	52 52	30	S.W. Little.	{ Fine mild cloudy morning, and day; fine night.
19	59 52	30	S.W. Little.	{ Very mild and cloudy this morning, with much rain till noon; fine sunshine most of the afternoon; fine mild night.
20	48 47	30.3	S.W. Little.	{ Very cloudy all this day, with some small rain; a little fog, and mild at night.
21	47 46	30.3	E. Little.	{ Fine mild morning, with rain in the night; a little sunshine in the forenoon; fine cloudy afternoon, with a close fog at night.
22	46 44	30.4	E. Little.	{ Clear morning, with heavy showers of rain at ten; fine sunshine at times afterwards; fine night.
23	45 43	30.4	E. Sharp.	{ Fine mild cloudy day, with some rain; fine clear night.
24	37 37	30.6	E. Sharp.	{ Some rain this morning, and very cloudy all day; wind very sharp; fine night.
25	38 37	30.6	E. Little.	{ Very cloudy this day, and sharp; very dark at night.
26	41 42	30.6	W. Sharp.	{ Cloudy sharp morning, with a little frost; some snow on the Dublin mountains; fine dry night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
27	48 48	30.4	W. Little.	{ Fine mild morning, with sun- shine after ten, most of the forenoon ; fine mild night.
28	51 50	30.4	W. Little.	{ A little small rain this morning ; with some sunshine at times most of the day ; fine night.
29	55 54	30.4	W. Little.	{ Cloudy this morning and mild, with sunshine at times ; fine mild and dark night.

Rain Gauge 1 inch, 50,000 parts.

MARCH, 1808.

Day.	Ther.	Bar.	Wind.	
1	55 54	30.3	W. Little.	{ Fine mild cloudy morning, and some sun at eleven; fine mild afternoon, and very cloudy; fine mild night.
2	53 57	30.2	W. Little.	{ Fine mild cloudy day, with fine sunshine at times all this day; fine night.
3	49 48	30.4	W. Little.	{ Fine mild morning, and sunshine at times all this day; fine mild night.
4	50 45	30.4	W. Little.	{ Fine mild cloudy morning, and continued so all day; close fog at night.
5	49 46	30.4	S.W. N.E. Little.	{ Fine mild morning, and sunshine all day after ten o'clock; close fog at night.
6	46 42	30.4	E. Little.	{ Fine mild morning, and clear sunshine all day, and wind pretty sharp; fine clear night.
7	42 41	30.5	E. Sharp.	{ A little frost this morning, with sunshine, and cloudy till four; fine sunshine afternoon; light at night.
8	39 38	30.4	E. Sharp pretty high.	{ Very cloudy, and cold all day; moon and stars at night.

Day.	Ther.	Bar.	Wind.	
9	43 42	30.4	E. Sharp.	{ Sunshine this morning; cloudy at times in the afternoon; a stormy night.
10	40 41	30.4	E. Sharp.	{ Cloudy and cold all day; cloudy and moonlight at times this night.
11	41 40	30.4	E. Most calm.	{ Cloudy this morning till nine; fine sunshine after; fine moon- light at night.
12	41 38	30.2	E. Sharp.	{ Fine cloudy mild day, and fine mild night.
13	45 43	30.3	E. Little.	{ Fine dry cold sharp day; fine clear night.
14	42 40	30	E. Little.	{ Fine clear sharp morning; cold sharp night.
15	40 39	30	E. Little.	{ Fine clear morning, and wind sharp; fine sharp night.
16	45 43	29.8	S.E. N.W. Little.	{ Fine cloudy sharp morning, and continued most of the day; close rain this night.
17	39 39	29.8	S. Little.	{ There had been rain in the night; mild morning, with rain till ten; cloudy afterwards; fine night.
18	37 37	30 29.8	E. Sharp.	{ Very cloudy this morning, with a little sunshine; a little snow at night, and sharp.
19	37 39	29.4	S.E. N.W. High.	{ Stormy morning, and small snow and wind high; heavy show- ers of snow in the forenoon, and rain at night.
20	44 45	29.4	S. Little.	{ Stormy morning, with rain at times, and continued; small rain most of the night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
21	52 48	29.6	W. Little.	{ Fine mild morning, with sun- shine all the forenoon; cloudy afternoon; fine mild night.
22	39 40	30	S.E. N.W. Little.	{ Cloudy this morning, with rain most of the day; fine night.
23	38 37	30	E. Little.	{ Very cloudy morning, with some snow at times in the after- noon; fine night.
24	38 38	30	E. Sharp.	{ Very cloudy and wind cold, with sunshine at times in the after- noon; hail at dark, and heavy snow most of the night.
25	38 39	30	E. High.	{ There had been snow in the night, and continued so this morning; ground covered with snow some inches deep; all gone by night; fine clear night, and wind pretty high.
26	43 42	30	S. Little.	{ Very stormy this day, with much rain in the afternoon; dark night.
27	43 42	30	S.E. Pretty high.	{ Very stormy this morning, with sunshine most of the day; fine night.
28	42 38	30.1	S.E. Sharp.	{ Fine cloudy morning, and sharp; fine sunshine this day after ten; fine clear night.
29	41 38	30.2	E. Sharp.	{ Sharp in the morning, and a little sharp with sunshine most of the day; sharp fine clear night, with a little frost.
30	41 39	30.1	E. Sharp.	{ Pretty sharp this morning, with fine sunshine most of the day; fine calm night.

MARCH, 1808.

101

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
31	44 43	30	E. Sharp.	{ Fine sharp morning, with sun- shine most of the forenoon; cloudy in the afternoon; sharp night.

Rain Gauge, 0 inch 654000, parts.

APRIL, 1808.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
1	45 42	29.7	E. Sharp.	{ Very cloudy this day, with showers at times, and wind sharp; fine night.
2	44 45	29.7	S. Little.	{ Sharp this morning, with frost; fine sunshine this forenoon; cloudy after; mild this night, with rain.
3	56 51	29.4	W. Little.	{ Fine cloudy mild morning; fre- quent heavy showers in the afternoon, and sunshine at times; showers at night.
4	62 59	29.1	W. High.	{ Very stormy this morning, and wind very high; fine sun- shine at ten, with a rain- bow; sunshine most of the day afterwards; some showers at night.
5	53 50	29.2 29.3	W. High.	{ Cloudy morning, with some heavy showers in the fore- noon, and sunshine at times; quite calm at night.
6	42 44	29.6	N.E. S.W. High.	{ Rain this morning, very close and small, which continued till four; smart showers at six; fine night.
7	46 45	29.7	E.N. E. Little.	{ Very cloudy and mild all this day, with frequent showers of rain; fine night.

Day.	Ther.	Bar.	Wind.	
8	53 52	29.8	S.E. N.W. Sharp.	{ Fine cloudy morning ; sunshine in the forenoon ; cloudy at night.
9	57 55	30.3	W. Little.	{ Fine clear morning, with sun- shine at times ; fine mild night.
10	59 55	30.3	W. Little.	{ Fine mild cloudy morning, with sunshine till ten ; a little rain after ; cloudy afterwards ; fine mild night.
11	53 47	30.1	W. Little.	{ Fine clear morning, with sun- shine, which continued most of the day ; some rain at night.
12	60 57	30.1	W. Little.	{ Fine clear morning, with sun- shine at times most of the day ; fine clear night.
13	61 60	30.3	W. Little.	{ Fine clear sunshine this morn- ing, and continued so all day ; fine sunshine in the afternoon ; fine mild night.
14	61 62	30.1	W. Little.	{ Very fine mild morning, with sunshine at ten, which con- tinued all day ; fine clear night.
15	59 57	30.1	W. Little.	{ Very fine clear morning, and continued so all day ; fine clear mild night.
16	52 46	30.2	S. Little.	{ Fine clear morning, and sun- shine all day ; fine clear night.
17	52 43	30.2	S.E. N.W. Little.	{ Fine clear morning, with sun- shine till noon ; cloudy after- noon ; fine clear night.
18	53 50	29.8	N.W. Little.	{ Very fine clear morning, with sunshine till noon ; some heavy showers at times in the after- noon, with sun ; clear night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
19	50 44	29.5	W. Little.	{ Clear this morning, with a little frost; fine sunshine most of the day, with showers of hail at noon; fine night.
20	48 47	29.5	N.W. Little.	{ Fine clear sharp morning, with a little frost, and fine sunshine till noon, and sun at times afterwards; fine clear night.
21	51 44	29.5	N.E. S.W. High.	{ Pretty sharp this morning, with sunshine till ten; cloudy, with frequent showers of hail at times; heavy shower of snow at seven; fine afterwards.
22	44 44	29.4	S.W. N.E. High.	{ Very stormy all night, and heavy driving rain at times most of the day; wind high at night.
23	48 44	29.7	W. High.	{ Fine clear morning, with sunshine after ten at times; showers at noon; fine clear night.
24	48 47	29.8	W. Little.	{ Pretty sharp this morning, with fine sunshine most of the day; clear night.
25	50 49	30.1	W.N. W. Little.	{ Very fine mild morning, with sunshine most of the day; fine mild night.
26	49 46	30.1 30	N. Sharp.	{ Sharp this morning, with fine clear sunshine all day; wind cold this night.
27	49 47	30	E. Little.	{ Cloudy mild morning, with sunshine at times; cloudy most of the day; fine mild night.
28	51 49	30	S.E. N.W. Little.	{ Fine mild cloudy day; fine mild night.
29	52 50	30	N.W. Pretty high.	{ Pretty sharp white frost this morning, with fine sunshine till ten; cloudy afterwards; very dark at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>
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30	61 57	29.8
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W. Little.

{ Fine mild morning; continu-
ed so most of the day, with
sunshine at times; dark at
night.

Rain Gauge, 1 inch, 280000.

MAY, 1808.

Day.	Ther.	Bar.	Wind.	
1	55 54	29.8	S.E. N.W. Little.	{ Very fine mild cloudy morning, and day ; fine mild night.
2	59 55	22.8	W. Little.	{ Mild morning, and fine sunshine after ten, which continued all day ; fine pleasant night.
3	64 62	29.8	W. Little.	{ Fine mild morning, with sun- shine all day ; fine mild night.
4	72 66	29.8.	E. Little.	{ Very cloudy, with some rain at nine ; fine sunshine all day afterwards ; a little rain at night.
5	63 59	29.8 29.7	S.E. N.W. Little	{ There had been rain in the night ; very fine cloudy morning ; continued so all day ; fine clear night.
6	58 55	29.5	N.W. S.E. Little.	{ Fine mild cloudy day, with some rain at times ; cloudy after- noon ; rain at night.
7	51 50	29.4	S.E. Pretty high.	{ Cloudy, with frequent showers of rain this morning, sun- shine at times, and wind stor- my ; fine night.
8	57 52	29.5	S.E. High.	{ Mild morning, with fine sunshine and showers ; wind high and stormy ; fine night.

Day.	Ther.	Bar.	Wind.	
9	56 53	29.4	S.E. N.W. Little.	{ Fine mild clear morning, with fine sunshine at ten; heavy shower of hail at noon; showers in the afternoon; fine night.
10	56 51	29.4	N.W. S.E. Little.	{ Cloudy this day, with sunshine at times, and frequent showers; fine clear night.
11	63 58	29.6 29.8	W. Little.	{ Fine mild cloudy morning, with a little sunshine at times; a shower at noon; cloudy in the afternoon; a rain-bow at six; fine night.
12	69 63	29.8	W. Little.	{ Very fine clear morning, with sunshine all day; showers at night.
13	63 62	30.1	W. Little.	{ Fine cloudy day, with some sunshine at times; some rain at night.
14	69 70	30.1	S.E. Little.	{ Fine mild morning, with sunshine most of the day; fine night.
15	66 68	30.1 29.8	E. Little.	{ Very fine mild morning, with sunshine most of the day; wind sharp at night, and clear.
16	71 69	29.8.	S.W. Little.	{ Fine clear morning, with sunshine most of the day; fine clear night.
17	70 63	30.1	W. Little.	{ Fine clear morning, with sunshine all day; fine pleasant night.
18	57 55	30.1	W. Little.	{ Fine clear morning, with sunshine all day; fine clear night.
19	66 63	30.2	E. Little.	{ Fine mild clear morning, with sunshine at times all day; fine night.

20	64 64	30	E. Little.	{ Fine mild morning, with sun- shine till noon; cloudy after- wards; fine night.
21	53 53	29.7	S.E. N.W. Pretty high.	{ Fine cloudy morning, with rain in the afternoon; fine night.
22	61 57	29.4	S.E. Little.	{ Cloudy this morning, with show- ers at ten; fine clear sunshine at twelve; cloudy in the after- noon; rain at night.
23	59 56	29.4	W.S. W. Little.	{ Fine clear morning, with sun- shine, and showers at times most of the day; heavy rain at night.
24	65 61	29.6	W. Little.	{ Fine clear morning, with sun- shine all day, and wind pret- ty high; heavy rain in the night.
25	58 54	29.6	S.E. N.W. Little.	{ Cloudy morning, and wind sharp, with some rain at times in the afternoon.
26	57 52	29.6	E. Pretty high.	{ Very cloudy this morning; there had been rain in the night; showers at times all day; rain at night.
27	59 56	29.6	E. Little.	{ Close rain this morning; cloudy after ten, with sunshine at times; fine night.
28	66 65	29.7	W. Little.	{ Fine clear morning, with sun- shine all day; heavy rain this night.
29	66 64	29.8	W. Little.	{ Fine cloudy morning, and wind pretty high; rain at times most of the afternoon; fine clear night.

MAY, 1808.

109

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
30	61 66	30	W. Little.	{ Heavy rain this morning; cloudy after ten, with showers in the forenoon; fine mild night.
31	63 64	30	W. Little.	{ Very fine mild morning, and sunshine all day; fine clear night.

Rain Gauge, 2 inches, 34000 parts.

JUNE, 1808.

Day.	Ther.	Bar.	Wind.	
1	67 65	30	W. Little.	{ Fine mild clear morning, with sunshine all day; fine night.
2	66 59	30 29.7	W. Little.	{ Fine mild cloudy morning; con- tinued so till noon; heavy showers at times in the after- noon; fine mild night.
3	63 61	29.7	S.W. Little.	{ Very fine mild morning, with small rain; cloudy, with heavy showers most of the day; sun- shine at times; fine mild clou- dy night.
4	61 61	29.8	N.E. Little.	{ Fine mild cloudy morning, with sunshine at times; a little rain in the afternoon; fine night.
5	62 61	29.6	N.E. Little.	{ Very cloudy this morning, with some small rain at times; ra- ther cold this night.
6	61 60	29.8	N.W. Little.	{ Clear cold morning, with sun- shine most of the day; fine clear night.
7	64 62	29.8	W. Little.	{ Fine clear morning, with sun- shine all day; fine mild night.
8	63 56	29.8	W. Little.	{ Fine mild cloudy morning; con- tinued so all the forenoon; small rain at three; fine night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	61 61	30	N.E. Little.	{ Fine clear morning, with sun- shine at times all day; fine mild night.
10	65 60	30.1	W. Little.	{ Fine mild morning, with sun- shine all this day; calm night.
11	72 70	30.1	W. Little.	{ Fine clear warm morning; sun- shine most of the day; fine mild night.
12	65 62	30.2	S.E. Little.	{ Fine clear morning, with sun- shine all day; fine mild pleasant night.
13	72 67	30.1	W. Little.	{ Fine clear morning, with sun- shine till ten; cloudy, with sunshine at times afterwards; fine mild night.
14	70 66	30	W. Little.	{ Fine mild morning, with sunshine most of the day; fine pleasant night.
15	69 65	30	S.W. N.E. Little.	{ Fine clear morning, with sun- shine; fine clear night.
16	65 62	30	W. Little.	{ Fine mild cloudy morning; continued so all day; fine night.
17	67 71	30	W. Pretty high.	{ Cloudy morning, and wind pretty high; small rain at ten, which continued till noon; cloudy fine night.
18	71 70	30	W. Little.	{ Very fine mild warm morning, with sunshine at times all day; fine night.
19	76 74	30	W. Little.	{ Fine warm cloudy morning, with some showers; very mild all day; sunshine at times; fine night.
20	79 71	30	W. Little.	{ Fine mild cloudy morning, and very warm, with sunshine at times all day; fine mild plea- sant night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
21	66 66	30	W. Little.	{ Fine mild cloudy morning; fine mild night.
22	69 68	29.7	E. Little.	{ Fine cloudy morning, with some sunshine at times; small rain at night.
23	66 62	29.6	S.E. N.W. Little.	{ Fine mild cloudy morning, with some sunshine at times; fine night.
24	66 65	29.7	S.E. N.W. Little.	{ Very cloudy morning; continued so all day; fine mild night.
25	68 66	29.8	E. Little.	{ Fine cloudy mild morning, with sunshine in the forenoon; cloudy afternoon; fine night.
26	67 64	29.8	E. Little.	{ Very fine mild morning, with sunshine most of the day; fine mild night.
27	73 62	29.8	S.E. Little.	{ Very fine mild warm morning, with sunshine; fine mild night.
28	74 71	30	S.E. Little.	{ Fine warm mild morning, with sunshine all the forenoon; cloudy afternoon; fine mild night.
29	69 65	30.1	S.E. N.W. Little.	{ Cloudy morning, with fine sunshine at times; fine pleasant night.
30	75 71	30.1	S.E. Little.	{ Fine clear sunshine this morning; continued so all day; mild clear night.

Rain Gauge 1 inch, 67000 parts.

JULY, 1808.

Day.	Ther.	Bar.	Wind.	
1	79 75	30	E. Little.	{ Fine clear sunshine this morning, and very warm; fine clear night.
2	79 75	30	E. Little.	{ Fine mild cloudy morning, and very warm, with fine sunshine; fine night.
3	72 67	30	N.W. High.	{ Fine mild warm morning, with fine sunshine, which continued all day; fine night.
4	71 62	30	N. Little.	{ Fine mild warm morning, with some sunshine at times, and cloudy; some rain at night.
5	71 68	30	N. Little.	{ Fine mild warm morning, and cloudy; continued so all day; fine mild night.
6	72 73	30.1	W. Little.	{ Very cloudy and warm this morning, with some sunshine at times; fine night.
7	71 70	30.1	W. Little.	{ Very cloudy fine mild warm morning, and day; fine mild night.
8	69 70	30 29.8	W. Little.	{ There had been rain in the night; fine mild cloudy morning, and day; fine night.

Day. Ther. Bar. Wind.

9 65 29.8 S.W. { Fine mild cloudy morning; con-
64 Little. } tinued so all day; fine mild
cloudy night.

10 71 30 S.W. { Fine mild cloudy morning, with
65 Little. } some small rain at noon;
sunshine at six; fine night.

11 70 30 S.E. { Fine clear morning, with some
73 Little. } sunshine at nine; some rain
at ten; cloudy afterwards;
fine mild night.

12 74 30 S.E. { Very clear warm morning, with
71 Little. } fine sunshine till ten; cloudy
afterwards; fine mild night.

13 73 30 S.E. { Fine warm mild morning, with
72 Little. } fine sunshine at times; fine
night.

14 74 30.1 N. { Fine warm clear morning, with
Little. } sunshine all day; fine mild
night.

15 61 30 N.E. { Very fine mild cloudy morning;
65 S.W. } heavy shower in the forenoon;
Little. } cloudy and mild afternoon,
with some thunder at times;
fine night.

16 71 30 S. { Heavy rain this morning till
69 Little. } nine; fine sunshine at ten;
some heavy showers at times
in the afternoon; fine mild
night.

17 76 30 S.W. { Very fine mild warm morning,
67 N.E. } and cloudy most of the day;
with sunshine at times; fine
mild night.

18 70 30 S.E. { Fine mild warm morning, with
69 Little. } sunshine at times, and cloudy
most of the day; fine clear
night.

Day.	Ther.	Bar.	Wind.	
19	69 69	29.7	S.E. N.W. Little.	{ Close rain this morning till nine; cloudy afterwards, with heavy showers at times; fine mild night.
20	68 67	29.6 29.5	N.W. S.E. Little.	{ Very heavy rain this morning till eleven; some sunshine after; heavy showers at four, with thunder; fine night.
21	67 61	29.4	S.E. Pretty high.	{ Very heavy rain this morning till nine; a little sunshine after, with heavy showers at times in the afternoon; rain at night.
22	59 61	29.8	S.E. N.W. Pretty high.	{ There had been rain in the night, and showers this morning; some showers in the forenoon; heavy showers in the afternoon; fine clear night, and wind pretty high.
23	67 65	30	W. Pretty high.	{ Fine clear morning, and wind pretty high, with some sunshine at times; fine calm night.
24	66 68	30	S.E. N.W. Little.	{ Very cloudy and mild this morning, with some heavy showers at noon; cloudy afternoon; fine mild night.
25	70 67	30.1	W. Little.	{ Fine mild cloudy morning, with some rain at times; fine mild night.
26	73 68	30.1	E. Little.	{ Very fine mild warm morning; cloudy most of the day; some rain at night.
27	70 65	30.1	W. Little.	{ Fine mild warm morning, and cloudy, with some sunshine at times; fine night.
28	74 68	30	W. Little.	{ Very fine mild warm morning, with sunshine most of the day; fine mild night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
29	70 69	30	E. Little.	{ Fine mild cloudy morning, and continued so all day; some rain at night.
30	74 68	30	S.W. Little.	{ Fine mild warm morning, and day; fine night.
31	70 68	29.8	S.W. N.E. Little.	{ Very mild warm morning; there had been rain in the night; some thunder about five; hea- vy rain at times after till seven this night.

Rain Gauge, 4 inches, 5000 parts.

AUGUST, 1808.

Day.	Ther.	Bar.	Wind.	
1	68 69	29.7	N.E. Little.	{ Fine cloudy morning, with heavy showers of rain at times this day; fine night.
2	70 69	30.3	N.E. Little.	{ Very fine mild warm morning; continued so all day; fine mild night.
3	75 68	30.3	N.E. S.W. Little.	{ Fine warm cloudy morning, with some sunshine at times in the forenoon; some small rain in the afternoon; fine mild warm night.
4	78 74	30.2	S.W. Little.	{ Fine warm mild morning, with sunshine all day; fine clear night.
5	68 67	29.8	S.W. Little.	{ Fine clear sunshine this morning; continued so all day; fine mild night.
6	73 72	29.7	W. Very high.	{ Very warm this morning; wind very high and stormy, with showers in the afternoon; fine mild night.
7	75 72	29.8	W. Little.	{ There had been rain in the night; fine warm mild morning; continued so all day; fine clear night.

Day.	Ther.	Bar.	Wind.	
8	72 72	30	S.W. Little.	{ There had been rain in the night; mild morning, with some showers at times; a very heavy shower after six, which continued till nine this night.
9	68 67	30	S.W. Little. high after.	{ Fine cloudy morning, and wind pretty high; fine mild night.
10	70 63	30.1	S.W. Little.	{ Fine mild warm morning, with sunshine at times; cloudy night.
11	67 65	30	S.W. Little.	{ Fine mild morning, with sunshine the most of the day; fine at night.
12	70 71	30 29.8	W. Pretty high.	{ Fine cloudy morning, with some sunshine at nine; cloudy most of the day after; rain at night.
13	70 69	29.7	S.W. Little.	{ Cloudy mild morning; continued so all day; fine clear night.
14	71 67	29.8	S.W. High.	{ Very stormy this morning, with heavy showers at times all this day; a rainbow at five; fine night.
15	68 68	29.8	N.W. High.	{ Very stormy this morning, with frequent showers till ten; cloudy afterwards; fine clear night.
16	70 70	30.1	N.W. High.	{ There had been rain in the night; very stormy in the morning, with some rain; cloudy most of the day; fine moonlight night.
17	68 67	30.2	N.W. Little.	{ Very cloudy this morning; continued so most of the day; pretty sharp in the afternoon; fine mild night.
18	68 72	30.4	W. Little.	{ Very fine mild cloudy morning; a very heavy shower at half past five; fine night afterwards.

Day.	Ther.	Bar.	Wind.	
19	77 71	30.4	W. Little.	{ Very fine mild warm morning, and cloudy; fine mild night.
20	79 71	30.4	W. Little.	{ Very fine mild warm morning, and cloudy all day; rain at seven this night.
21	77 73	30.5	W. Little.	{ Very fine warm cloudy mild morning, with sunshine most of the day; some small rain in the afternoon; fine night.
22	68 68	30.5	S W. Little.	{ Very fine cloudy morning, and calm fine clear night.
23	73 67	30.4	S.W. Little.	{ Very fine mild warm cloudy morning, with fine sunshine in the forenoon; fine clear night.
24	72 67	30.4	S.E. N.W. Little.	{ Very fine mild warm morning, with sunshine at times; fine clear night.
25	73 72	30.3	E. Little.	{ Very fine cloudy morning till ten; sunshine all day after; fine night.
26	64 64	30	N.W. Little.	{ There had been rain in the night, with showers in the forenoon; a heavy shower at night, with lightning.
27	67 63	30	N.W. S.E. Little.	{ Fine cloudy mild morning, with some rain in the afternoon; cloudy this night, with rain.
28	66 63	30	N.W. Pretty high.	{ Fine clear sunshine this morn- ing; cloudy in the afternoon; a shower at six.
29	68 65	30	S. Very high.	{ Very stormy this morning, with showers at times most of the day, and wind very high; rain at night.
30	65 64	29.6	S. High.	{ Pretty heavy rain this morning till eight; clear afterwards; frequent showers all the fore- noon; fine clear stormy night.

Day. Ther. Bar. Wind.

31 63 29.6
59

S.W.
N.E.
Little.

Very cloudy this morning,
with a shower at nine; cloudy
in the forenoon, and a heavy
shower at four, with thunder;
fine night.

Rain Gauge 1 inch, 834 parts.

SEPTEMBER, 1808.

Day.	Ther.	Bar.	Wind.	
1	65 63	29.7.	S. Little.	{ Fine clear morning till ten ; cloudy after, with showers in the forenoon ; showers in the afternoon ; fine clear night,
2	68 66	29.8.	S.W. N.E. Little.	{ Cloudy morning with small rain till ten ; sunshine after, with showers at noon ; fine afternoon ; fine clear night.
3	64 65	30.1	W. Little.	{ Cloudy morning, with rain till ten ; frequent showers afterwards ; heavy rain at night.
4	71 66	30.1	W. Pretty high.	{ Very fine clear morning, with sunshine all day ; fine clear night, and wind pretty high.
5	60 62	29.8	W. Little.	{ Mild cloudy morning, with close small rain from nine till noon ; heavy showers at times afterwards.
6	64 64	29.8	W. Little.	{ Fine sunshine this morning till nine ; cloudy after, with heavy showers at noon ; fine clear night.
7	66 63	29.4	W. High.	{ Cloudy this morning, with showers of rain at times most of the day ; fine clear night.

8	59 60	29.4	N.W. N.E. Little.	{ Cloudy this morning, with some heavy showers at times; heavy rain at six, with a rainbow; fine night.
9	58 58	29.4	N.E. S.W. Little.	{ Very cloudy this morning, with rain most of the morning, and showers in the forenoon; fine afternoon; fine clear night.
10	67 68	29.6	W. Little.	{ Fine clear morning, with sunshine most of the day; some rain at night.
11	67 62	29.8	N.W. S.E. Little.	{ Very fine mild morning, with sunshine; fine clear night.
12	63 60	29.8.	S.W. Little.	{ Very fine clear morning, with sunshine all day; fine clear night.
13	64 60	29.8	W. Little.	{ Cloudy morning till eight; clear sunshine all day afterwards; fine night.
14	68 63	29.8	W. Little.	{ Very fine clear morning, with sunshine; fine clear night.
15	66 65	30	W. Little.	{ Very fine clear morning, with sunshine most of the day; close fog this night.
16	69 65	30.2	S.W. N.W. Little.	{ Close rain this morning; very fine sunshine after ten; heavy rain at night.
17	64 62	30	S.E. N.W. Little.	{ Very close fog this morning till seven; fine sunshine most of the day; fine night.
18	61 61	30.1	E. Little.	{ Very fine clear morning, with sunshine in the afternoon; fine clear night.

Day.	Ther.	Bar.	Wind.	
19	61 62	30.2	N.E. S.W. Little.	{ Very fine clear morning, with sunshine all day; fine clear night.
20	66 61	30.2	N.E. Little.	{ Fine clear morning, with sun- shine all day; some stars this night.
21	67 64	30	E. Little.	{ Very fine clear morning, with sunshine all this day; dark night.
22	63 58	30	S.E. N.W. Little.	{ Cloudy this morning, and some rain; cloudy after ten, and heavy showers of rain; fine night.
23	54 54	30.2	W. Little.	{ Cloudy this morning; fine sun- shine all day; fine clear night.
24	58 58	30.2	W. Little.	{ Sharp this morning; there had been frost in the night; clear sunshine most of the day; dark night, with some rain.
25	66 65	30.1	W. Little.	{ Very mild and cloudy this morn- ing, with fine sunshine at times; fine clear night.
26	65 57	30.1	S.W. N.E. Little.	{ Cloudy this morning, and mild with some rain at times; fine night.
27	58 50	30.1	N. Sharp.	{ Cloudy sharp morning; very cold in the afternoon; clear moonlight at night.
28	42 45	29.4	S E. N.W. Most calm.	{ Very cloudy morning, with some rain till ten, and at times all day; very heavy rain at se- ven; fine moonlight at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar</i>	<i>Wind.</i>	
29	51 48	29.6	N. Little.	{ Very cloudy this morning; continued so most of the day, with sun at times; heavy rain at seven; fine clear night.
30	50 49	29.8	S.E. N.W. Little.	

Rain Gauge 1 inch, 590 parts.

OCTOBER, 1808.

Day.	Ther.	Bar.	Wind.	
1	51 49	30	N.W. Sharp.	{ Fine clear sharp morning, with sunshine most of the day; close fog at night.
2	49 47	29.5	S.W. Little.	{ Heavy rain all night, which continued all the forenoon; some sunshine in the after- noon, with a shower of rain; fine moonlight night.
3	51 51	29.7	S.W. Little.	{ Fine mild cloudy morning, with some sunshine till noon; some rain at night; fine moonlight at ten.
4	61 56	30	S.W. Little.	{ Some rain this morning; show- ers in the forenoon; fine clear night.
5	60 58	30.1	S.W. N.E. Little.	{ Very cloudy this morning; con- tinued so all day; fine mild night.
6	56 54	30	W. Little.	{ Cloudy all day; fine night.
7	55 53	30 29.5	S.E. N.W. High.	{ Very cloudy and stormy this morning; wind very high, with some heavy showers in the afternoon; wind high at night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
8	49 47	29.5 29.8	W. Very high.	{ Very stormy day, and wind very high; some showers at times; clear moonlight night.
9	48 46	29.8	N.W. Very high.	{ Cloudy this morning, and cold wind, with some rain in the forenoon; stormy at night, with rain.
10	53 52	30	N.W. Sharp.	{ Fine clear morning, with sunshine; wind pretty sharp; cloudy at times in the afternoon; fine mild clear night.
11	57 52	30	W. Sharp.	{ Very stormy this morning till ten; some rain in the forenoon, and wind high; fine moonlight night.
12	52 48	30	S.W. N.E. Pretty high.	{ Cloudy this morning, with sunshine and showers at noon; sunshine in the afternoon; stormy night.
13	68 49	29.8	N.E. S.W. High.	{ Fine clear morning till ten; cloudy afterwards all day; fine night.
14	49 47	29.7	W. Little.	{ Very stormy this morning, and pretty sharp all day; fine night.
15	52 49	29.5	W. Very high.	{ Sharp this morning, and stormy; fine sunshine in the afternoon; fine clear night.
16	50 46	29.4	N.W. High.	{ Very stormy this morning; there had been rain in the night; showers most of the day; clear night.
17	47 45	29.7	E. Little.	{ Very fine clear morning, and stormy most of the day, with showers at times; fine clear sharp night.
18	48 47	29.7	W. Sharp.	{ Very sharp and clear this morning, with fine sunshine most of the day; clear night.

Day.	Ther.	Bar.	Wind.	
19	48 46	29.8	N.W. High.	{ Stormy night; cloudy in the morning, with sunshine at noon, and wind very high in the afternoon; rain at night.
20	53 52	29.7	N.W. S.W. High.	{ Cloudy this morning till ten, with sunshine; cloudy and stormy after, with dashing rain; dark at night.
21	49 45	29.6	S.W. N.E. High.	{ Cloudy this morning, with sunshine at noon; stormy afterwards, with rain.
22	43 42	29.7.	W. Sharp.	{ Fine clear morning, with sunshine all day; fine clear night.
23	50 50	29.6	N.W. Sharp.	{ Cloudy, mild morning, with showers in the afternoon; fine clear night, with stars.
24	53 52	29.4	W. Sharp.	{ Fine clear morning, with sunshine all day; clear moonlight at night.
25	55 54	29.5	W.S. W. High.	{ Cloudy stormy day, with dashing rain; wind very high; dark night.
26	51 46	29.4	S.W. Little.	{ Cloudy morning, with heavy showers of rain and sunshine at times; fine night.
27	51 47	29.4	N.W. Little.	{ Very cloudy this morning till ten; fine sunshine most of the day after; fine night.
28	51 50	29.3	S.E. N.W. Little.	{ Fine clear morning, with sunshine at noon; heavy rain at times in the afternoon; fine night.
29	51 44	29.5	S.E. N.W. Little.	{ Very cloudy this morning, with some sunshine at times, and a little rain; fine night afterwards.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
30	50 43	29.7	N. Little.	{ Fine clear morning, with fine sunshine most of the day; clear moonlight.
31	45 45	30.4	N. Little.	{ A little frost this morning, with fine sunshine most of the day; close fog at night.

Rain Gauge 2 inches, 040 parts.

NOVEMBER, 1808.

Day.	Ther.	Bar.	Wind.	
1	49 45	30.4	N.E. Little.	{ Cloudy this morning, with fine sunshine most of the day; fine mild night.
2	50 47	30	E. Little.	{ Very mild this morning, with fine sunshine most of the day; fine mild night.
3	48 45	30	E. Little.	{ Fine mild morning, with fine sunshine at times in the fore- noon; fine clear night.
4	47 46	30	S.E. N.W. at night High.	{ Cloudy mild morning, and con- tinued so all day; wind pret- ty high at night.
5	44 43	30	N.W. S.E. Little.	{ Cloudy mild morning, and con- tinued so most of the day; fine night.
6	45 43	29.8	S.W. Little.	{ Stormy this morning, with dash- ing rain till ten; sunshine af- ter; fine night.
7	46 46	29.7	S.W. Little.	{ Cloudy most of the day; sun- shine at times; fine mild night.
8	45 44	29.7.	S.E. N.W. Little.	{ Fine mild cloudy morning, and continued so all day; fine mild dark night.

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
9	49 49	29.7	N.E. Little.	{ Fine mild cloudy morning, and continued so all day; fine night, and wind high.
10	50 49	29.7	E. Pretty high.	{ Fine cloudy mild day; fine night, but very dark.
11	49 48	30	S. High.	{ Cloudy sharp morning, and continued so all day; fine mild night.
12	45 44	30	S.W. Pretty high.	{ Fine cloudy morning, and continued so all day; fine clear night.
13	46 44	30	S.W. Little.	{ Very cloudy this morning, and continued so all day; fine night.
14	54 51	30	S.W. N.E. Pretty high.	{ Very cloudy this morning, and wind very stormy; clear fine night.
15	54 51	29.6	W. Sharp.	{ Fine mild morning, and continued so all day; fine night.
16	56 54	29	W. Very high.	{ Wind very high this morning, and continued so all the forenoon, with heavy rain at times; rain at night.
17	51 47	29	W. Pretty high.	{ Wind pretty high this morning, with rain at times, and some sunshine at times; fine clear night.
18	49 42	29.	W. High.	{ Very heavy rain this morning, till ten, with heavy showers till noon; fine afternoon; sharp cold night.
19	41 40	29.6.	N.W. Little.	{ Pretty sharp frost this morning, with fine sunshine after ten; fine clear night.
20	48 46	29.7	N.W. Little.	{ Very cloudy this morning, and continued so most of the day; very heavy rain most of the afternoon; fine clear night.

Day.	Ther.	Bar.	Wind.	
21	51 48	30	N.W. Sharp.	{ Very fine clear morning, with sunshine most of the day; fine clear night with stars.
22	52 51	30	W. Little.	{ Cloudy morning, and a little sharp; some sun at times; fine moonlight at night.
23	51 50	30.1	W. Little.	{ Fine clear morning, and conti- nued so all day; fine clear night.
24	47 47	30.1	WS. W. Little.	{ Cloudy this morning till ten, with close small rain after- wards; heavy rain at night.
25	51 51	29.8	W. Little.	{ Cloudy this morning, and close small rain most of the day; fine clear night.
26	54 53	30	W. Little.	{ Fine mild cloudy morning, with some small rain at times most of the day; rain at night.
27	49 45	30	W. Little.	{ Cloudy this morning, with a heavy shower at eleven; fine after, with some sunshine; fine mild night.
28	40 45	29.8	N.W. Sharp.	{ A little frost this morning; clou- dy till noon; some rain in the afternoon; fine night.
29	47 50	29.7	S.W. N.W. High at night.	{ Mild and cloudy this morning; some rain at times this day; heavy rain at night.
30	45 41	29.5	N.W. N.E. Sharp.	{ There had been much rain in the night, and a great flood; sharp and cloudy this morning; hea- vy showers of rain at twelve; fine clear cold night.

Rain Gauge 2 inches, 330 parts.

DECEMBER, 1808.

Day.	Ther.	Bar.	Wind.	
1	46 45	29.4	N.E. S.W. Little.	{ Fine clear sharp morning, and continued so all day; sharp cold night.
2	48 47	29.6	S.W. N.E. High.	{ Very stormy this morning, with some rain, which continued most of the day; some rain at night.
3	48 46	29.6	W. Pretty high.	{ Very cloudy this morning, and continued so most of the day; fine moonlight this night.
4	49 47	29.7	W. Pretty sharp.	{ Very close fog this morning, and continued so till ten; fine sunshine most of the day afterwards; fine moonlight at night.
5	58 56	29.6	S.W. N.W. Pretty high.	{ Cloudy morning, and continued so most of the day; dark at night.
6	48 46	29.8	E. Pretty high.	{ Stormy morning, with dashing rain most of the morning; cloudy, with showers most of the day; fine clear moonlight night.
7	43 42	30	N.W. Sharp.	{ Cloudy this morning, and continued so most of the day; cold at night.

Day.	Ther.	Bar.	Wind.	
8	44 44	30	N.W. Sharp.	{ Very cloudy, and pretty mild this morning, and continued so most of the day, with some sunshine at times; close fog at night.
9	49 47	30	N. Sharp.	{ Very cloudy and mild this morning, with some rain at times; very dark night.
10	46 41	30.1	N.W. Sharp.	{ Very fine clear morning till ten; fine sunshine most of the day after; clear at five; a kind of fog at night.
11	36 38	30.1	N.W. Little.	{ Pretty sharp white frost this morning; fine sunshine till ten; cloudy all day afterwards; fine night.
12	44 43	30.1	W. Pretty high.	{ Cloudy mild morning, and continued so all day; fine mild night.
13	44 45	30.1	W. Sharp.	{ Very cloudy this morning, with some rain at times most of the day; fine clear night.
14	45 37	30.1	W. Sharp.	{ Fine clear morning, with fine sunshine all day; a little frost at night.
15	49 38	30.1	S.W. N.W. Little.	{ Pretty sharp white frost this morning; Dublin mountains covered with snow; cloudy after ten, with small rain at times most of the day; fine mild night.
16	35 34	30.1	N.W. Sharp.	{ Cloudy cold morning, and continued so all day; fine clear night.
17	39 30 11 n. 25	29.7	N. Sharp and high	{ Fine cloudy mild morning till ten; sunshine afterwards; very sharp frost at night; ther. 25 at eleven this night; wind sharp and high.

Day.	Ther.	Bar.	Wind.	
8 m. 25				{ Very sharp frost this morning ; ther. 25 at eight ; continued freezing all day ; wind very sharp ; fine clear starlight at night ; ther. 29 at ten.
18 33	29.7	N.		
29		Sharp.		
10 n. 29				
8 m. 29				{ Pretty sharp frost this morning ; ther. 29 at eight ; ground co- vered with snow ; fine sun- shine at twelve ; fine after- noon ; sharp frost in the even- ing ; cloudy at ten, and the frost going off ; ther. 28.
19 29	29.7	N.		
26		Sharp.		
10 n. 28				
8 m. 26				{ Sharp frost this morning, with some snow on the ground ; ther. 26 at eight ; sunshine this day ; fine clear night, and sharp frost ; ther. 23 at eight this night.
20 29	29.6	N.		
29		Sharp.		
10 n. 23				
21 37	29.5	N.E.	{ Cloudy this morning, with some rain at times ; cloudy after ten, and snow mostly gone ; fine clear night.	
38		S.W. Little.		
22 34	29.4	N.	{ A little frost this morning ; ther. 31 at eight ; there had been snow in the night ; fine sun- shine all day ; sharp frost at night.	
32		Sharp.		
23 32	29.3	W.N.	{ Fine clear morning, with a little frost ; heavy snow in the af- ternoon till dark ; a little frost at night.	
31		W. Little.		
24 34	29.2	W.S.	{ There had been much snow in the night, and snow in the morning ; showers of snow all day ; fine night.	
32		W. Little.		
25 37	29.4	W.S.	{ Fine mild clear morning, and the snow six or seven inches deep on the ground ; fine mild night, but dark.	
35		W. Little.		
26 38	29.3	W.S.	{ Cloudy mild morning, and the snow going off ; fine mild night, and dark.	
36		W. Little.		

<i>Day.</i>	<i>Ther.</i>	<i>Bar.</i>	<i>Wind.</i>	
27	39 38	29.3	W. Little. breeze.	{ Fine mild cloudy morning, and continued so most of the day; some rain at times; snow going off fast; wind pretty high.
28	41 42	29.3	W. Little. breeze.	{ Cloudy mild morning, and the snow mostly gone; wind pretty high; heavy rain in the forenoon; fine afternoon; fine night, and snow almost gone.
29	44 45	29.3	S.E. Little.	{ Fine mild morning; cloudy all day; some small rain in the afternoon; mild rain at night, and wind high.
30	44 44	29.3	S.E. Little.	{ Very fine mild morning, and continued so most of the day; some small rain in the afternoon; fine night.
31	44 43	29.3	S.E. Little.	{ Very fine mild morning, and cloudy all day; wind pretty high; some small rain in the afternoon; fine night, but dark.

Rain Gauge 2 inches, 773 parts.

Total 23—1820000

**METEORIC
OBSERVATIONS,**

MADE IN AND NEAR

THE

CITY OF LONDONDERRY,

In the Year 1805;

WITH

PRACTICAL REFERENCES,

BY

WM. PATTERSON, M. D.

1870

1871

1872

1873

1874

1875

METEORIC OBSERVATIONS, &c.

SUMMARY NOTATION

OF

METEORIC INSTRUMENTS.

MONTHS.	BAROMETER		THERMO METER		HYGRO- METER. <i>De Luc.</i>		RAIN-GAUGE.	
	<i>max.</i>	<i>min.</i>	<i>max.</i>	<i>min.</i>	<i>max.</i>	<i>min.</i>	<i>Inches.</i>	<i>Parts.</i>
January	30.18	28.37	44	31	42	38 $\frac{3}{4}$	3.	967235
February.....	30.	28.95	51 $\frac{1}{2}$	30	44	30 $\frac{1}{2}$	2.	837502
March.....	30.24	29.35	54 $\frac{1}{2}$	39 $\frac{1}{2}$	42 $\frac{1}{4}$	35	2.	522224
April.....	30.22	29.53	54	43 $\frac{1}{2}$	39 $\frac{2}{5}$	32	0.	945834
May	30.46	29.15	68	40	35 $\frac{1}{4}$	28 $\frac{2}{5}$	1.	418751
June	30.52	29.39	61 $\frac{1}{2}$	49	34	29 $\frac{1}{4}$	2.	417105
July	30.32	29.34	69 $\frac{1}{2}$	57 $\frac{1}{2}$	35 $\frac{1}{2}$	30	3.	836856
August	30.37	29.38	68 $\frac{1}{2}$	57 $\frac{1}{2}$	37	33	3.	15078
September	30.74	29.24	69 $\frac{1}{2}$	45	39 $\frac{1}{2}$	33 $\frac{1}{2}$	2.	522224
October.....	30.54	29.52	61 $\frac{1}{2}$	32	37 $\frac{3}{5}$	35 $\frac{1}{5}$	0.	748784
November.....	30.82	29.05	55	32	38 $\frac{3}{5}$	37	1.	57639
December.....	30.34	28.74	44 $\frac{1}{2}$	—	40 $\frac{2}{3}$	38 $\frac{1}{2}$	4.	807919
Mean of the Year	29.61. +		50.25.		35.94 +		30. 751604	

Being abroad the coldest part of December, the lowest degree of the Thermometer was not ascertained for that month.

DIRECTION AND NUMBER

OF THE

WINDS.

MONTHS.	North	South	East.	West.	North East.	South East.	North West.	South West.
January	1	5	7	7	4	10	2	8
February	1	—	5	7	3	—	5	9
March	—	7	1	9	—	7	4	10
April	2	6	4	6	8	2	5	4
May	11	—	4	6	4	3	7	1
June	9	—	2	4	2	2	19	1
July	8	—	—	10	1	—	16	6
August	3	4	—	18	—	—	5	9
September	3	5	—	17	—	1	6	10
October	3	10	10	2	6	5	—	3
November	5	3	2	14	—	2	5	10
December	4	—	—	18	5	—	8	2
Total of the Year	50	40	35	118	33	32	82	73

SYNOPTICAL

SYNOPTICAL VIEW

OF

COMMON PHENOMENA.

MONTHS.	Fair.	Show- ery.	W. t.	Hail.	Snow.	Frost.	Fog and Haze.	Thunder & Light- ning.
January.....	15	11	5	—	5	11	7	—
February	8	14	6	3	3	8	1	1
March.....	9	16	6	1	—	—	—	—
April	8	22	—	5	1	—	—	—
May	14	17	—	5	2	—	2	—
June.....	8	19	3	2	—	—	—	—
July	10	21	—	—	—	—	1	—
August.....	8	23	—	1	—	—	—	—
September.....	7	23	—	—	—	—	2	—
October.....	18	13	—	1	—	1	2	—
November.....	16	14	—	—	1	1	3	—
December.....	6	19	6	9	7	5	1	—
Total of the Year	127	212	26	27	19	26	19	1

Thunder

Thunder and lightning were uncommonly rare this year. If more of this meteor happened than is set down, it was so remote, or faint, that it escaped observation.

A considerable number of showery days are noted, which proceeds from registering every day, as showery, wherein *any rain* is known to fall in the course of the 24 hours. If this were done in the diaries kept in other nations, I am convinced that, comparatively, a much less number of showery days would be found to have taken place in Ireland, than in other countries supposed greatly to surpass this island in fair weather. As to the quantity of rain, I have elsewhere shewn, that the annual average in Great Britain exceeds that in Ireland at least 20 inches,

MONTHLY REMARKS.

The winds, in JANUARY, were generally high; and, on the 14th, there was a very heavy storm from the S. W. but it did no more damage than strip a few houses of some slates. There was some keen freezing, though of short continuance; and the snow, that fell, soon dissolved on the low grounds and minor hills. There was a good deal of fair weather; and the most of the
rain

rain, that happened, descended in showers. A considerable verdure covered a majority of the fields, especially the meadows wherein cattle were not suffered to pasture, which exhibited a lively tint of that colour, for which the hibernal vegetation of Ireland is distinguished, "gay green."*

IN FEBRUARY, the winds were moderate till the last week, when they became boisterous, and the 28th presented a desperate night of wind, rain, hail, and snow, with thunder and lightning, the wind blowing from the N. W. Though congelation frequently took place, the greater part of the month was temperate, some days warm, owing to mild winds, and the disengagement of caloric in the deposition of vapour. The quantity of rain, that fell, was not in a ratio proportionate to the number of showery and wet days. In the grass-fields, the lively verdure continued.

During the greater part of MARCH, especially in the beginning, and toward the end, of the month, the winds blew fresh. Although there were frequent showers, the roads were at times so dry that clouds of dust annoyed the traveller; whence they, who think that a peck of March dust is

* The causes of that verdure are discussed, by the writer of this article, in a Memoir, published in the 8th volume of the Transactions of the R. I. Academy—Science, pag. 245.

is worth a peck of gold, must have been thoroughly gratified. The temperature of the month was variable: now mild and rather warm, again sharp and really cold; yet "smiling nature's universal robe" still decorated the meadows, particularly those irrigated. The progress also of other families of the vegetable race was favourable: apple, pear, cherry, and filbert trees were budding the first week. A great deal of ploughing, and some harrowing, were done against the middle of the month, and these works continued to go on well. As the first day of March was decidedly of a violent nature, and as the last was of rather a mild description, this month may be said, in the old phrase, to have "come in like a lion, and to have gone out like a lamb."

In the course of APRIL, the winds were chiefly moderate, but there were some blowing days, and two or three composed of gusts. There were several pleasant days, in which the air was quite tepid, and these were succeeded by a harsh, penetrating, cold state of the atmosphere. A great dryness existed in the air; for the actual wetness was in no degree proportionable to the enumeration of the showers, which were generally slight, and the little moisture they yielded soon evaporated. Hence, as might be expected, the dust was abundant and flying, like what it was in March.

The

The first day of the month, the gorse or whin was in full blossom in an exposed situation near the shore; and eight days afterwards, the same species of shrub was only in half blossom in a warmer station. About the same time, the white-thorn was in leaf, and the black-thorn was in flower. Towards the end of the month, the willow, birch, and elm, were in open leaf; and the oak and ash were beginning to bud, or in budlets. The beech, which is also a late tree, was not visibly budding; but the large fruit-trees were in full blossom.

This month, being extremely dry, was very favourable to the vitality of the seed, and to the growth of the grain, especially in cold wet ground; and the farmers reckoned the cold weather in the latter part of the month useful, inasmuch as it repressed the vegetation, without impairing it, and prevented the grain from becoming too early luxuriant, which would render it more obnoxious to the baleful effect of blighting winds or weather in May, or in June.

Throughout MAY, the winds were in the main moderate, except the last week, when fresh gales sprung from the N. The general temperature of the month was cold; but at times it was remarkably variable, considerable warmth, particularly in the sun, alternating with a sharp coldness. It might be supposed from the number of showery
days

days, stated in the third table, that the character of this month would be wet rather than dry ; but the fact is, that on several of those days very little rain fell, and the winds were of an extremely drying quality.

Three or four nights, in the commencement of the month, such a degree of refrigeration took place in the country, that hardy potatoes, planted in drills, which had attained a suitable height, and which had been left without their cover of straw, were blasted ; but in the same garden there were potatoes under glass, which would be ready for use about the middle of the month.

From the 14th to the 21st, the white-thorn blossoms were opening ; the horse-chesnut in full flower ; the ash partly in bud, and partly in leaf ; and the beach and elm in open leaf.

The blossoms of the large fruit trees, together with the shaped fruit of the small trees, were damaged by the hail ; but the flax, that was up, escaped unhurt both from the hail and the sharp weather.

JUNE produced some fresh breezes, but the majority of the winds were moderate. A similar degree of dryness to that of the preceding month took place during the first week of this, and then some useful rain fell, attended with a temporary amelioration of the rigorous air. In
this

this also, as in the two former months, the wetness was not in proportion to the number of showers; and the atmosphere was generally cold, as well as dry.

From the end of the first week, an extraordinary luxuriance appeared in the blossoms of the white-thorn, of the broom, and of the gorse or whins. The grass, in the meadow-grounds, was short and thin, until seasonable rain fell, the 7th, accompanied with a relaxation of the sharp tone of cold; at the same time, the flax, which was two or three inches high, was uniform and promising. Before the termination of the month, barley was in ear in an exposed situation, and but middling soil, some miles north of the town; and, near the town, grass was mowed, though the spring had been so dry, and the growth of herbage so backward even at the beginning of this month.

The winds, in JULY, though cold, were almost altogether moderate in degree. The temperature of the atmosphere was often unequal; one time warm, even to sultriness; next cold; and then in a medium. A good deal of rain fell in heavy showers, but there was no day wet throughout.

Against the second week, crops of all kinds were very much improved; some fields of oats
were

were shot about the middle of the month; and several lots of flax were in blossom.

From the nature of the predominant winds, in AUGUST, which were at once soft in quality and moderate in degree, it follows that the temperature of this month was mellow and warm, quite the reverse of the four antecedent months. The most of the rain, that fell, was in heavy showers, which chiefly happened in the morning, and in the night.

SEPTEMBER contained a good deal of warm, with some sultry weather, and but few blowing days. The quantity of rain was not in proportion to the number of showers, which were indeed frequent. In the town there was not any congelation, but in the country, at the close of the month, there was freezing, preceded by two or three nights of hoar frost.

Several fresh breezes, and a few squally gales particularly at night, occurred in OCTOBER. The winds were chiefly cold and dry, which, with a considerable areactive power in the atmosphere, occasioned great aridity in the grounds; so potent were the effects of this combination on the high roads, that the dust was many days actually heating to the horses' feet, and rolled about in volumes as in the driest spring, or even summer. The first congelation observed this season, in the town, occurred the 30th at night.

Against

Against the 12th, the grain, to a considerable extent round Derry, was entirely in, and the haggards were snug and secure. Not only were the corn crops well got in, but they also were abundant in quantity; yet the farmers said, that the kernel or pickle was not firm. For digging and housing the potatoe crop, which was plentiful and of good quality, the season was remarkably favourable and dry; so dry was it that no earth stuck to the potatoes, and it was said that some farmers added clay to them, when putting them in the bins, or stores. Apples, pears, and plums abounded; nuts were not plenty; and honey, in general, was scarce.

The 13th of this month, at night, being a few miles to the S. E. of Derry, I observed an atmospherical phenomenon, which seems to shed light on the part, which *electron* acts in the structure and modification of clouds.*

The

* The friends of science are indebted to L. Howard, Esq. for his ingenious "Essay on the Modification of the Clouds," which he treats on philosophical principles, and which he endeavours to reduce to peculiar laws; but it has been justly remarked, that he has passed over the operation of electricity in too cursory a manner, especially if, as our ingenious countryman, Mr. Eeles, believed, electricity be the principal cause of the ascent of vapour. This I conceive to be a material omission in Mr. Howard; and therefore, having collected some observations on the subject, I intend to communicate them (if acceptable) to the Dublin Society, as soon as circumstances will permit.

The breezes were more moderate than customary in NOVEMBER; the air was often mild, nay warm: and but little rain fell in proportion to the showers and the season. The barometer was mostly high; though frequent S. W. winds, there was a good deal of dry weather; and the roads continued dusty till after the first week.

In DECEMBER were some squalls, especially at night, and often with hail; but in general the winds were moderate. The frost was neither long nor severe; and the snow, which did not amount to more than five inches deep, soon disappeared. The 3d, there was a moist warmth in the air, communicating a sensation as if enclosed in a warm vapour, which proceeded from the disengagement of heat and the deposition of moisture; not a rare occurrence in our winter seasons; and, taking place in the inferior strata of the atmosphere, it may contribute towards our hibernal verdure.

COMPARATIVE HINTS.

IN America, the cold of the winter 1804-5, was remarkably severe; witness the following extract of a letter from a correspondent in Baltimore, dated February 15th, 1805:—"There has been the severest winter in America since the year

year 1780 or 83: even in this place the mercury has been as low as 10° . some say 6° . of Fahrenheit; and a sheet of ice covers nearly one half of the Chesapeak. The broadest rivers bear heavy laden waggons; and the ink has frequently frozen in my pen at the fire-side. It seems strange, that it should be so extremely cold in lat. 39° .; but the horribly huge mass of ice and snow, which lies behind us in Canada, and stretches thence even to the Pole, (which some philosophers say is annually increasing in size), must for every season produce cold winters to the greatest part of this division of the continent."

At Derry, in December, 1804, there were several days of frost, but not more than four or five in succession, some of which, it is true, were keen; yet the general temperature of the month was not rigorous, and at times the weather was as temperate as mild April weather; the lowest degree of the thermometer was $21\frac{1}{2}^{\circ}$. Adding to this the still more moderate temperature of January and February, 1805, we shall have a winter very far from the frigid state of the season in Baltimore, which is 16 degrees nearer the S. than Derry.

Throughout the northern part of the continent of Europe, indeed, the winter set in very severely about the middle of November; a strong easterly

easterly wind blew ; and the canals and smaller streams were very soon covered with ice. About the same time we had some E. and S. E. winds, but the temperature of the air was moderate.

The northern mountains of ice and snow may have had some share in causing the unusual prevalence of the cold northerly winds with us in spring, as well as in the beginning of summer. For we learn, that great islands and fields of ice proceeded from the North Pole into the Atlantic lower even than 44° . N. latitude, by which the *Jupiter*, of New York, foundered the beginning of April, and other ships suffered serious damages. Before that voyage of the ice, Ireland was kept temperate in the winter by the warming effects of the gulf-stream, which must be very powerful on this country, when they mollified the rigour of those vast magazines of cold ; but the northern districts of the continent of Europe, not having the same advantage, were soon brought under the icy dominion of the higher latitudes.

On the 10th of June, at Galway, was a severe storm of thunder and lightning, with heavy rain, and a west wind ; at Derry, neither thunder nor lightning was observed, but the day was warm, and there was considerable rain, with a S. E. wind, about the same hour that the storm happened at Galway.

From

From the peculiar position of the sun and moon, on the 10th of August, it was expected that a great increase of tide would take place that day and the three days following, and that hence would be afforded a good opportunity to ascertain the moon's influence over the ocean, by observing the height of the tide at the principal maritime ports. To what extent observations of this kind were made, I cannot say ; but I know, that on the low shores of a considerable estuary, Lough Swilly, the tides did not run in so far at that juncture, as they are wont to do at the same period of the moon, viz. full ; which is one instance contrary to the expected elevation of the waters.

In the spring and part of the summer, Bohemia and Silesia were visited by a famine, which occasioned popular tumults, wherein many lives were lost. Whether that famine were produced by political, moral, or physical causes, I shall not pretend to judge ; but this I will venture to pronounce, that in Ireland there was no scarcity of food ; for at Derry, which in fertility is inferior to many other districts, the harvest of 1804 was safe and plentiful.

In the evening of the 28th of June, at London, occurred a violent storm of thunder and lightning, attended with the descent of large pieces of shapen ice, so sharply pointed that many per-

sons were cut by them, and they broke several sky-lights in the city, together with panes in hot-houses, &c. in the gardens of its vicinity. At Derry, there was not any disturbance in the atmosphere, and nothing more is noted in the Diary, than that it was fair and cold, with a moderate N. Wind. In September, at London, occurred another frightful storm of thunder and lightning, with heavy rain; whereas, at the same time, in Derry, the atmosphere was quite temperate.

August the 26th, a dreadful earthquake desolated the city of Naples and a great part of the kingdom, in which, it was computed, 20,000 persons perished. It was preceded by a great increase of heat, a north wind, and a commotion in the sea. An immense and very thick column of smoke issued from the summit of Vesuvius, and between the first and second shock two explosions from the mountain were heard. At Derry, the same day, the air was warm, though little sunshine; there were heavy showers; and there was a moderate breeze from the S. W. How tranquil and happy our climate, compared to those where the elements war with such hideous and destructive vehemence!

DATA FOR PREDICTION.

THE year, 1805, furnished the following meteoric phenomena, furnishing contributions towards the attainment of rules for presaging the weather. When, in January, an aurora borealis appears, with tokens of thaw in frosty weather, although there should be strong indications of snow in the clouds and temperature, more probably rain will happen. In the same month, a lunar hale, cold temperature, a falling barometer, and smoaky clouds, with S. and S. E. winds, are not necessarily attended with snow, but rather may be expected to end in heavy rain, and in high wind from another quarter, most probably from N. W. Sooty, low clouds, with spitting snow, in this month, were said by the country people to indicate a great fall of snow, yet little fell, even throughout the succeeding months, and what did drop, soon dissolved.

In February, the warmth and moisture was, in one day, followed by cold and frosty weather; the same phenomenon, in the subsequent December, was not followed by the like weather till after the lapse of four days; in the former case there were two days of warmth, in the latter there was but one day of it.

The 16th of March, the column of quick-silver, in the barometer, was descending, and at the same time was round at the top; which tends to corroborate an observation, made by Mr. Brooke, that quick silver running out at the bottom of a tube will exhibit a prominence of this description. Hence this appearance in the summit of the mercurial column does not absolutely indicate an immediate rise in the instrument; although it may be the harbinger of a favourable change in the atmosphere, as it was in this instance, when, on the 3d day, commenced a set of good weather, notwithstanding the winds were S. and S. E. But the hygrometer was at a tolerably dry degree of the scale, which denotes fair weather, even when other circumstances appear to have an opposite tendency. April furnished facts for similar observations.

In September, during heavy rain, in the night, with a fresh breeze from the N. W. the barometer ascended, and mounted even to 30.27, yet it was not attended with entirely fair weather. In all seasons a N. W. wind, whatever be the state of the barometer, brings showery or wet unpleasant weather; a S. W. wind is also a wet-bearing quarter; but a S. E. wind will sometimes blow two or three days without introducing rain. A wind due south, with the barometer ranging between 29 and 30, even with a covered sky, provided

vided the cloudy veil be high and thin, is attended with fair weather, until it veer either to S. W. or to S. E. and then the weather immediately breaks.

In all journals of the weather, it is of the first importance to pay attention to the states and changes of the winds; at least, I am sure, it is the case with respect to Ireland; and, I conceive, it is no less important with regard to Great Britain. It is true, there is reason to believe, that a change of temperature generally precedes a change of wind; but the former is often so obscure, or so transient, that it escapes observation; and the latter, the wind, changes so frequently in the night that, whatsoever be the previous alteration of temperature, which then takes place, seldom or never can it be noticed. Impressed with the truth of this remark, and convinced that the winds are powerful arbiters of our weather, I have, during several years past, watched their changes with proportionate care, and accordingly I possess, perhaps, the most complete memorial of these interesting meteors, hitherto recorded in Ireland.

It would be of unspeakable advantage to the interests of society, were a valid system of meteoric prognostics obtained for each civilized country. The undertaking, it is certain, would be attended with no small difficulty; but, it is
equally

equally certain, that it is practicable. A combination of learned bodies, and of scientific individuals, could most assuredly accomplish it, and in comparatively a short time, considering the multitude of facts already made known. Nay, from the spirit, which reigns in many places, I am not afraid of being thought romantic in venturing to prophesy, that the fulfilment of this most desirable event is at no distant period. Hitherto this branch of meteorology has been too much slighted, and supposed out of reach. But why is not the economy of the atmosphere governed by laws, cognizable by the intellect and industry of man, equally as the laws which regulate other departments in nature? And why, then, may not the former laws be as attainable as the latter?

Several causes have conspired to retard the progress of meteoric prediction. Crude, arbitrary assertions, astrological phantasms, and traditional reports are amongst the first obstacles; these are followed by a passion for generalizing from a fact or two, by a propensity to apply to all places rules applicable only to the place of observation, and by the practice of deducing signs from one instrument, or from one phenomenon, or from one season.

If a few intelligent people, in the several divisions of a country, such as the provinces of Ireland,

Ireland, would keep registers of the phenomena of the atmosphere, even without meteoric instruments, and would publish the result, they would contribute more to the advancement of meteorology than they might at first imagine. But if, to these registers, they would add the state of a comparable barometer, thermometer, &c. their communications would be proportionably more valuable. Though making experiments in the vast laboratory of nature, a man would find the work both easy and entertaining. While amusing himself, and only gratifying curiosity, he would be promoting knowledge, and procuring benefits for posterity. I have kept a meteoric register above 20 years, and never found that it interfered with the duties of an active profession, but rather corresponded with them, and has afforded me a relaxation at once pleasing and rational. The fruit of those observations, aided by other researches on the subject, has been a tolerable knowledge of the climate of Ireland, which I have partly traced in a work already before the public; a work that is only the *Avant-coureur* of another, which requires little more than copying, for the press, and which I design to entitle, "Observations on Ireland, Physical, Moral, and Medical."

In no science, not even in astronomy, is man furnished with equal facilities to trace some of
the

the most interesting of the works and wonders of creation, as in meteorology; every day in his life, amidst his common occupations, he may study in the school, and do homage in the temple, of nature; a school and a temple not made by the hand of man, but by the will of God. Then, contemplating the stupendous operations of the atmosphere, when retired from the busy haunts of men, the mind is exalted into a state of devotion and delight, which words are incompetent to express.

“ Witness, ye hills! with many a vapoury wreath
Entwin’d, whose green brows court the sunny ray;
Witness, ye spicy gales! whose odours breathe
The glowing blush of health where’er you stray;
Ye silvery streams! that, warbling, wind away,
Whose tiny Naiads are with amber shod;
Witness what rev’rence I was proud to pay,
When awfully sequester’d, I have trod
Lone *Nature’s* paths recluse, to *Nature’s* bounteous God.”

Londonderry,
October 31st, 1806.



SKETCH
OF
LECTURES
ON
MEADOW AND PASTURE GRASSES,
DELIVERED IN THE
DUBLIN SOCIETY'S BOTANICAL GARDEN,
GLASNEVIN.

BY
WALTER WADE, ESQ. M.L.S.

OF THE KING AND QUEEN'S COLLEGE OF PHYSICIANS IN IRELAND, PHYSICIAN
TO THE DUBLIN GENERAL DISPENSARY, HONORARY MEMBER OF THE
DUBLIN SOCIETY, APOTHECARY'S HALL, AND FARMING SOCIETY OF
IRELAND; PROFESSOR AND LECTURER ON BOTANY TO THE
ROYAL COLLEGE OF SURGEONS IN IRELAND, AND TO
THE RIGHT HONORABLE AND HONORABLE THE
DUBLIN SOCIETY.

"Hinc fessæ pecudes pingues per pabula læta
Corpora deponunt, et candens lacteus humor
Uberibus manat distentis." LUCRETIVS.

DUBLIN:
PRINTED BY GRAISBERRY AND CAMPBELL,
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1808.



PREFACE.

THE public lectures given on meadow and pasture grasses, in the Dublin Society's Botanical Garden, Glasnevin, having been much attended to, the professor and lecturer on botany to the Society considers himself called upon, from that attention which has been paid to them, and some strong solicitations made to him, to publish a sketch, or brief syllabus, by way of heads, of the most interesting points and useful facts he has brought forward upon the occasion, by which means the public may be the better enabled to understand the subject, and to profit by the information; and more particularly should the *Pecudarium* and *Fœnarium*, or cattle and hay divisions of the garden, and *Gramina Vera*, or true grass division, arrest their attention, and induce their exertions for the improvement of their meadow and pasture lands, and the feeding of their different useful domestic animals, as horses, horned cattle, sheep, &c.

The professor is likewise the more willing to put such a sketch forward, not only from the self-evident necessity of the measure, but from the opportunity that is now afforded, through the liberality and favour of the Society, of consulting the most splendid, the most valuable, and the most interesting publications on the various subjects of agriculture and rural economy, in the Society's extensive and scientific library; among which may be noticed that first-rate splendid work, Host's Austrian Grasses; (*Icones et Descriptiones Graminum Austriacorum Nicolai Thomæ Host, M. D. Vindobonæ 1801, 1802, 1805.*) The uncommon great accuracy of the descriptions, and the highly finished, exact, and satisfactory representations of the different objects noticed in this publication, must stamp it as one of the very first rate performances on the subject of grasses.

To make this sketch still more useful and interesting, coloured figures of the different grasses noticed will throughout be referred to, in authors of the highest celebrity.

EXPLICATION

EXPLICATION OF THE NAMES OF THE
CONTRACTED AUTHORS.



- Fl. Lond.* Flora Londinensis.—By Wm. Curtis,
London, 2 vols. folio.
- Eng. Bot.* English Botany.—By J. E. Smith,
M. D. and James Sowerby, F.L.S. London,
25 vols. &c. 8vo.
- Fl. Rust.* Flora Rustica.—By Thomas Martyn,
B. D. F. R. S. &c. and Frederick P. Nodder,
London, 4 vols. 8vo.
- Gram. Brit.* Gramina Britannica, or Represen-
tations of British Grasses.—By F. L. Knapp,
Esq. F.L.S. & A.S. London, 1 vol. 4to. 1804.
- Gram. Aust.* Icones et Descriptiones Graminum
Austriacorum.—Nicholai Thomæ Host, M.D.
Vindobonæ, 1801, 1802, and 1805, 3 vols.
imperial folio.
- Cat. Syst. Dub.* Catalogus systematicus planta-
rum indigenarum in comitatu Dublinensi in-
ventarum.—Auctore Gualtero Wade, M.D.
&c. Dublini, 1794, 1 vol. 8vo.
- Fl. Dub. Spec.* Floræ Dublinensis Specimen.—
By Walter Wade, M.D. &c. folio, with plates.
Pl.

Pl. Rar. Hib. Plantæ rariores in Hibernia inventæ.—By Walter Wade, M.D. &c. 1804, Dublin, 1 vol. 8vo.

De Holco Odorato. De Holco Odorato, or observations on sweet-scented Holcus.—By Walter Wade, M.D. &c. 4to. 1804, with a figure.

Transf. Dub. Soc. Transactions of the Dublin Society for 1804.

INTRODUCTION.

ABSOLUTE necessity of botanical knowledge in relation to agriculture and the feeding of cattle;—vegetable world intended for the support of the animal world—a few animals carnivorous—certain plants disagreeable to some, which are agreeable to others—some poisonous, wholesome to others—this not by chance—for the very best purposes—wisely ordained that certain plants must be left to certain animals—do not all grow in the same climate—every plant has its destined spot—animals who live upon particular plants, abound in certain situations—rein-deer lichen* on cold alpine situations—induce the rein-deer to live there the whole winter—sheep's fescue-grass,† supposed to induce sheep where it abounds—camel's hay—camels reside on the barren loose sands,

* *Lichen rangiferinus*, Eng. Bot. v. 3. p. 173. Pl. Rar. Hib. 127.

† *Festuca ovina*, Eng. Bot. v. 9. p. 586. Cat. Syl. Dub. 25.

sands, where it abounds—many similar instances adduced—brutes designed by nature to be guided by instinct—incautiously acting against it, death or disease the consequence.

Plants injurious only respectively to the species of animals—spurge, or wart-wort*—juice injurious to the human species—some insects live entirely upon it—long-leaved water-hemlock† will kill a cow—goats delight in it—monk's-hood will kill a goat—innoxious to horses—many other examples.

Young animals least deceived by their smell and taste—nice and cautious in distinguishing plants—hunger compels many to eat plants not intended for them by nature—meadow-saffron,‡ strange cattle frequently killed by eating it—fall into dysentery when brought into marshy grounds—cattle used to such places, avoid the plants injurious to them—dreadful effects on horned cattle, by eating long-leaved water-hemlock—to goats, as before, delicious.

——“Videre

* *Euphorbia helioscopia*, Fl. Lond. v. 1. t. 71. Eng. Bot. v. 13. 833. Cat. Syl. Dub. 130.

† *Cicuta virosa*, Eng. Bot. v. 7. 479.

‡ *Colchicum autumnale*, Eng. Bot. v. 2. 133. Fl. Russ. t. 60.

——“ Videre licet pinguescere sæpe *CICUTA*
Barbigeras pecudes, homini quæ est acre venenum.

LUCR.

Experiments on different animals with poisonous plants—no information as to their effects on the human frame—only here in an agricultural point of view. Many instances—some very striking—in Virginia, a species of andromeda a rank poison to sheep—perhaps the marsh-andromeda* of our boggy and marshy situations has the same effect?

By attention, the rural economist may judge of the produce of his different grounds—some afford wholesome nourishment, others not—pressed by hunger, animals will feed on vegetables not grateful or nourishing—not indifferent what species of seeds meadow and pasture lands are sowed with—horses nice in choosing their food—horned cattle, and sheep not so—goats feed upon the greatest variety of plants—necessary for the farmer to be well acquainted with the peculiarities of animals—likewise to judge of his hay—cattle will eat plants in a dried state, which they refuse to eat when green—perhaps not affording good and natural

* *Andromeda polifolia*, Eng. Bot. v. 10. 713. Pl. Rar. Hib. 31.

tural nourishment?—propensities of certain animals to certain plants—cows supposed to eat the crowfoot or butter cups of our fields—not so—they are of a very acrid nature when fresh, and blister the skin—sheep killed in the county Derry, by eating bulbous-rooted crowfoot.*

Apparent that certain animals will feed upon herbs, which others refuse—many are highly noxious to some, whilst they are eaten with impunity by others—early known—first race of shepherds had daily instances among their flocks—known only in the general until of late—butterwort,† hound's-tongue,‡ henbane,§ mullein,|| hemlock,¶ figwort,** &c.—untouched by horses and

* *Ranunculus bulbosus*, Fl. Lond. v. 1. t. 38. Eng. Bot. v. 8. 515. Cat. Syf. Dub. 150. Fl. Ruft. t. 28.

† *Pinguicula vulgaris*, Eng. Bot. v. 1. 70. Cat. Syf. Dub. 8.

‡ *Cynoglossum officinale*, Fl. Lond. v. 2. t. 256. Eng. Bot. v. 13. 921. Cat. Syf. Dub. 51.

§ *Hyoscyamus niger*, Fl. Dub. Spec.—Eng. Bot. v. 9. 591. Cat. Syf. Dub. 61.

|| *Verbascum thapsus*, Eng. Bot. v. 8. 549. Cat. Syf. Dub. 60.

¶ *Conium maculatum*, Fl. Lond. v. 1. t. 42. Eng. Bot. v. 17. 1191. Cat. Syf. Dub. 77.

** *Scrophularia nodosa*, Eng. Bot. v. 22. 1544. Cat. Syf. Dub. 171.

and cattle—cows killed by eating ladies mantle*—irremediable costiveness—hemlock dropwort†—highly poisonous—eaten by sheep and goats—refused by cows and horses—common yew ‡—leaves in a half dried state, fatal to horses and cows—goats eat it with safety—daisy, §—horses, sheep, and cows seen to refuse it—acid—many more instances—a course of experiments to ascertain the facts—necessary, and of the utmost consequence—might lay the foundation of further improvements in the economy of cattle, and the laying out of lands. With this view *Fœnarium* and *Pecudarium*, or hay and cattle divisions, and *Gramina Vera*, or true grass division, in the Society's garden. Pecudarium for the most part taken from Pan Suecus, *Amœnitates Academicæ*, vol. 2.—above 2000 experiments tried—the sexual or Linnæan system adhered to in this essay—perhaps arranging the plants, agreeable to their usual places of

* *Alchemilla vulgaris*, Eng. Bot. v. 9. 597. Cat. Sysf. Dub. 45.

† *Ænanthe crocata*, Fl. Dub. Spec.—Cat. Sysf. Dub. 81.

‡ *Taxus baccata*, Eng. Bot. v. 11. 746. Pl. Rar. Hib. 84.

§ *Bellis perennis*, Fl. Lond. v. 1. t. 13. Eng. Bot. 424. Cat. Sysf. Dub. 234.

of growth, would be a more apt disposition?—indigenous plants in Sweden, three fourths the same as in Ireland—from the Swedish experiments—horned cattle eat of plants offered to them 276 species, rejected 218—goats 449, refused 126—sheep 387, refused 141—horses 262, refused 212—swine only 72, refusing 171!

GRAMINA

GRAMINA VERA,
OR
TRUE GRASSES.

SCARCELY a name, besides the general one, till within some years back—forms one single idea—a husbandman does not know there are some hundred species*—a great number immediately under his eye—their proper names not generally in use—a just knowledge of them still in its infancy—has not been cultivated on scientific principles—true grasses, their definition—white and red clovers, with faint-foin and lucern, not grasses—their value as artificial or sown grasses. True grass has every constituent part of a flower—the very great majority belong to the class Triandria Digynia in Linnæus's artificial system—a few to other

* Willdenow in his Species Plantarum, enumerates nearly 600 species, including wheat, oats, barley, rye, &c.

Doctor Withering in his arrangement of British plants, 123 British species. Mr. Curtis, 115.

The Flora Britannica of Doctor Smith, the standard for botanical accuracy, 113 species.

other classes—examples—their seeds do not split into two lobes—rather peculiar to grasses—necessary to arrange grasses into some general subdivisions—spikes and panicles—easily understood—other circumstances—spike defined—panicle defined.

SPIKED GRASSES.

Anthoxan`thum odora`tum,

Sweet smelling, or early spring grass.

Irish name, EARACHFHEUR DEADHBHOLADH.

Fl. Lond. v. 1. t. 51. Eng. Bot. v. 9. t. 647.

Gram. Brit. t. 1. Gram. Aust. vol. 1. t. 5.

Fl. Rust. 23. Cat. Syst. Dub. 10.

Some peculiar characters, by which it may be known—a very early grass—though early, continues in marshy situations to produce flowering spikes all the summer—its value doubtful—in moist soils and situations—chiefly in wet lands—often luxuriant in bogs—Statistical Report of the county of Derry—as part of 100, seems to be the most predominant—some circumstances attending its feeding state—careful to observe the proper time of collecting the seed—a curious provision of nature for disseminating the seed—upper part of the husks ripe, and the seeds dispersed before the lower part is ripe—least productive of seed of the
valuable

valuable grasses—should it be considered as such, —possesses warm aromatic qualities—may be useful in curing the spring diseases of cattle?—Mr. Marshal, Rural Economy of Gloucestershire—his observations on this head—supposed to be a good grass for sheep pastures—the late Mr. Curtis's observations—colour of spike—pale yellow when ripe, hence *αυθός* and *ξανθός* yellow flower.

Rev. Doctor Richardson,—“Elementary treatise on the indigenous grasses of Ireland,” very useful—has much merit—his observations on this grass—does not seem to approve much of it.

Doubtful whether this grass communicates the sweet smell to hay—at the time grasses are cut, is dried up, sapless, and inodorous—might it not afford the most early food for lambs, cultivated alone?

Alopecurus pratensis,

Meadow fox-tail grass,

Irish name, ULPLOSFHEAR LEANA.

Fl. Lond. v. 2. t. 300. Fl. Rust. 6. Eng. Bot. v. 11. t. 759. Gram. Brit. t. 14. Gram. Aust. vol. 2. t. 31. Cat. Sys. Dub. 17.

Scientific name from *αλωπηξ*, *αλωπηξ*, and *ουρα*, fox's tail—easily known by the hoary soft appearance of its spike—*Phleum pratense*—spike much longer

longer and rough—fox-tail grafs in some wet meadows, common—flowers not much later than anthoxanthum—seeds remain in the husk a long time—not easily collected—food of a certain species of insect—one third of the seed destroyed by its ravages—propagation and diffusion by seed—extermination to be dreaded—happily provided against by the interposition of another insect, or bug—*Cimex campestris*—makes the former its peculiar food—destroys thousands in a day—peculiar circumstances attending fox-tail grafs—stalks green and succulent, after the husks have dropped—seed resembles a grain of wheat in miniature—fox-tail grafs vegetates quickly—cut three times in the season—possesses three great requisites, quantity, quality, and early growth—will not thrive in deep manured soils—as a low land grafs, particularly valuable—Doctor Pultney's opinion—Linnæus's—Young's Annals, vol. 12. 418. 16, 130, &c.—fox-tail grafs perhaps the best to improve moist grounds?

A native of most parts of Europe—in many counties in Ireland not common—in some very scarce, and not to be met with—in some counties in England locally found—in South Wales very scarce—perhaps originally introduced into our meadows and pastures?—Mr. Marshal, “Devonshire Economy,” could not find it—Dr. Richardson's opinion of foxtail-grafs.

Phle'um

Phleum pratense,

Meadow cat's-tail grass—herd grass.—Timothy grass?

Irish name, LOSCATFHEUR LEANA.

Fl. Rust. t. 5. Eng. Bot. v. 15. t. 1076. Gram.
Brit. t. 6. Cat. Syst. Dub. 16.

φλειον or φλειως, Theophrastus—Phleos, Pliny.

Distinguished from foxtail-grass by its rough and long cylindric spike—other distinctions—flowers very late—proper only for moist lands—difference of opinion as to its merits—cows not fond of it—sheep dislike it—swine refuse it—is the Timothy-grass of North America the same as ours?—Mr. Timothy Hanson—Mr. Wych—Museum Rusticum, v. 2. 161—seeds remain well on the stalks and are easily collected—“Tyrone Statistical Report”—not common in the county of Tyrone—sour, strong clay soils most proper for it—seeds heavier than those of any of our common grasses—working horses thrive remarkably on cat's-tail-grass—“Derry Report”—excellent in meadows—“Down Report”—fine crops nearly all of this grass—“Kilkenny Report”—all grasses with close heads, good—poas and panicked grasses not esteemed—“County of Dublin Report”—Mr.

Dutton's opinions.—Doctor Richardson's observations—worthy of attention.

From close observation, harsh, late, and not luxuriant, till very late in the season—consult *Fœnarium*, or hay division in the Botanical garden.

In the Statistical Survey of the county of Kildare just published, the author, when speaking of meadow and pasture grasses in general, observes, “that the grasses in the meadow and feeding pastures of the county are of the most valuable kinds; when submitting tillage land to grass, the farmers chiefly sow the seeds from the natural meadows, which are filled with red and white clover, trefoil, ray-grass, white hay-feed, foxtail, meadow fescue, ribwort, &c. &c. In the bottom meadows, particularly those subject to flood, *Timothy-grass* is the principal herbage.”

Lo'lium peren'ne,

Perennial darnel grass, red darnel grass, ray grass, rie grass, crap.

Irish name, ROILLE MARTHANACH.

Fl. Rust. 4. Cat. Syst. Dub. 32. Eng. Bot. t. 315. Gram. Brit. t. 100. Gram. Aust. v. 1. t. 25.

Many varieties—perhaps all of equal value?—affords excellent hay upon upland pastures and dry

dry situations—springs as early as other grasses—on very rich soils, a worse grass cannot be sown—extraordinary that goats are not fond of it—some objections to its cultivation—sometimes proves an annual.—Anderson's Essays—Marshall's Gloucestershire—Young's Annals of Agriculture—many useful remarks—Bath Papers—clean hay made of it, preferable for race-horses and hunters—does not affect their wind—affords twice as much nourishment as common hay—horses reject clean corn for it.

None of the writers of the last century speak of ray grass—Plot's Oxfordshire, 1667, first noticed—his remarks worthy of attention.

Large quantities of the seed to be had in many parts of England—some varieties lately much spoken of—Mr. Pacey's variety—has it superior merit? Suspected that by long cultivation the nature of ray-grass is changed—some further interesting remarks on ray-grass—the flowers sometimes furnished with aristæ, awns, or beards—characteristic of *Lolium temulentum*, a dangerous species—"Down Statistical Report"—ray-grass the most excellent they have—"Kilkenny Statistical Report"—some curious and interesting particulars relative to ray-grass, white-hay-feed, and soft brome-grass—"County of Dublin Report," Mr. Dutton's remarks.—Doctor Richardson—no opinion of ray-grass.—Duke of Bedford's commu-

nication—entitled to much respect and attention—His Grace's remarks on Pacey's ray grafs—the late Mr. Richard Reynell of Reynella—his remarks and practical investigations—curious and interesting—a variety of *Lolium perenne*, annual! noticed before. Some further remarks. Mr. Campbell, an enlightened agricultural writer—ray-grafs united with clover, an excellent sward the end of the second year—practical observations by Mr. Campbell.—Do the stems and flowering parts of grafs, or the leaves taken weight for weight, contain most nutriment?—Stems sweeter than the leaves—vegetables containing much saccharine matter, particularly nutritious—the culmi, or stalks of ray-grafs very sweet—therefore the running up to stems, perhaps, forms no objection—stems not so apt to be injured by continued rains as leaves—not subject to mould.

Ray-grafs engages the attention of intelligent farmers at the present day—further particulars—few graffes more early in the spring—none more relished by cattle, or more nutritive—resists bad weather in trying hay seasons—feeds more easily collected, than most other grafs seeds—prejudices against it refuted. Some facts adduced to establish its nutritive properties by an accurate practical observer.

Lolium

Lo'lium temulen'tum,

Annual darnel grafs, bearded darnel.

Irish name, ROILLE BREOILLEAN.

Fl. Rust. 4. Eng. Bot. t. 315. Gram. Brit. t. 101. Gram. Aust. vol. 1. t. 26. Plant. Rar. Hib. 6.

Lolium λαιον ολειν, segetem perdere, or λαιον ολον, feges noxia.

Not immediately belonging to our present inquiry—a dangerous grafs among corn, and should be well known—scientific and common distinctions—sometimes a weed among grain—a small proportion of its flour, among wheat flour, bread eaten hot, produced violent disorders in the human body.—Leer's Flora Herbornensis, “Gramen inter omnia unicum noxium. Semen temulentos vertiginosque reddit homines, magis adhuc in pane calido, potissimum in potu cerevisia. Etiam equis, canibus, suibus, aliisque animalibus noxium, sæpe lethale.” Seed, malted with barley, occasions drunkenness—hence French name, *Ivrâie* (ivre) perhaps has occasioned the Irish name, *river*? Not so common as to be extensively dangerous—whole counties without a single specimen—in Pembrokehire so common, as to lease it from their

their corn to burn it—Welch farmers—in English wheat, this noxious grass seldom found—the native grown corn sowed, always produces it—*Lolium arvense*, corn rye-grass—much similarity—a scarce grass.

Deleterious effects suspected early—Ovid—Virgil twice cursed *lolium*—modern Italians—melancholy habits, “A mangiato pane con loglio.”—St. Matthew’s gospel—the tares certainly infelix *lolium*—proofs.

Hor'deum mur'inum,

Wall barley, way bennet, wild rye, rye-grass, squirrel-tail grass.

Irish name, EORNA BALLA.

Fl. Lond. v. 2. t. 327. Fl. Rust. 108. Eng. Bot. 469. Gram. Brit. t. 104. Gram. Aust. v. 1. t. 32. Cat. Syst. Dub. 32.

Worthy of notice, though an annual, from its early growth—may afford abundant spring food—in an advanced state bad—reasons—very seldom seen in meadows or pastures—sometimes found among hay, therefore should be known—grows in particular situations.

Isle of Thanet grass—not the murinum, but the maritimum, or sea species. Eng. Bot. v. 17. 1205. Gram.

Gram. Aust. v. 1. 34. Fl. Rust. t. 44. Awns or beards of this very rigid and strong—highly troublesome and dangerous to horses when mixed with hay—Haller's opinion of wall barley preposterous?

Hor'deum praten'se.

Meadow barley grafs.

Irish name, EORNA LEANA.

Fl. Rust. 108. Eng. Bot. t. 409. Gram. Brit. t. 105. Gram. Aust. v. t. 33. *H. secalinum*?

A more delicate species than the former—forms sometimes a great part of meadow crops—its growth should not be encouraged—high authority to the contrary—Professor Martyn.—Only species that vegetates in pastures.

Cynosu'rus crista'tus,

Crested dog's-tail-grafs, windlestraws.

Irish name, TRATHNINFHEUR CIRAINACH.

Fl. Rust. 106. Eng. Bot. t. 316. Gram. Brit. t. 64. Gram. Aust. v. 2. t. 96. Cat. Syst. Dub. 34.

Scientific generic name from *κυνός* & *οὐρα* dog's tail.

Has

Has obtained character as food for sheep—reasons assigned—found on good wholesome pastures in high dry grounds—much esteemed, mixed with hard fescue grass*—the late Mr. Curtis's opinion of it not favourable—"County Down Statistical Report"—a very nutritive grass—"Kilkenny"—as amongst the starved and useless—further remarks on this grass—culmi or straw-leaves—flowers—semina, or seeds.

Triticum repens,

Dog's grass, squitch grass, couch grass, creeping wheat grass, quickly.

Fl. Rust. 124. Eng. Bot. v. 13. t. 909. Gram. Brit. t. 111. Gram. Aust. v. 2. t. 21. Cat. Syst. Dub. 33.

Irish name, CRUITHNEACHD BRUIMSEAN.

Triticum πρυος q. σπρυος from σπρυος seed—Latin, q. tritum, *vel quod ex spicis triturando facile excutiat*ur.

Very common and much disliked by the farmer—bad husbandry and horticulture, that suffer it's growth—watering the lime too much, encourages

* *Festuca duriuscula*, Eng. Bot. v. 7. t. 470. Gram. Brit. t. 68. Gram. Aust. v. 2. t. 83. Cat. Syst. Dub. 26.

rages and promotes its vegetative powers—best means to avoid too generally its dissemination.—The clean husbandman and gardener consider many grasses as couch—creeping soft grass,* oat-like soft grass, or tall oat grass,† &c.—roots—leading joints so sharp and strong as to pierce any moderately hard substance, that may come in their way—therefore easily eradicated—does not spread itself by seed—every joint of the root wonderfully increases it, hence one of its names quick or live grass.

Roots taste like liquorice—sold in large quantities in the markets at Naples for feeding horses—ground with meal—bread.—Cattle cured of schirrous liver in the spring by eating this grass—dogs—leaves vomit—further remarks.

PANICLED

* *Holcus mollis*, Fl. Lond. v. 2. t. 320. Fl. Rust. 119. Eng. Bot. v. 17. t. 1170. Gram. Brit. t. 37. Gram. Aust. v. t. 3.

† *Avena elatior*, Fl. Lond. v. 1. t. 192. Fl. Rust. 7. Eng. Bot. v. 12. t. 813. Gram. Brit. t. 39. Gram. Aust. v. 2. t. 40.

PANICLED GRASSES.

Po'a praten'sis,

Smooth stalked meadow grass, great meadow grass.

Irish name, CUISE MIONGHASACH.

Fl. Lond. v. 1. t. 82. Eng. Bot. v. 15. t. 1073.

Gram. Brit. t. 55. Gram. Aust. v. 2. t. 61.

Cat. Syft. Dub. 22.

From *Ποα*, an herb—Theophrastus, a plant in general—*ποα ἑσπέρη ἐκαστή*, grass as when it is joined with wheat and barley.

Cautiously to be introduced—reasons why—roots propagate themselves like couch—in very old ley grounds very little of this grass—scientific and common distinctions between it and *Poa trivialis*, or rough stalked meadow grass.—*Flora Anglica*, Mr. Hudson—*Flora Londinensis*, Mr. Curtis. Never throws up flowering stems or bents but once in a season—hardy and full of verdure—would answer for certain purposes.—Affords a good crop of sweet leaves at bottom—relished by cattle—affords fine hay, &c.—seeds long in the husk after they are ripe—larger than the seeds of *Poa trivialis*—are covered with a cobweb downy substance, and which adheres to them closely.

Doctor Richardson—inferior in many respects to *Avena flavescens*, yellow oat grass—does not possess the ground so long.

Po'a

Poa trivialis,

Rough, or roughish stalked meadow grass, common meadow grass.

Irish name, CUISE GARBGHASACH.

Fl. Lond. v. 1. t. 90. Eng. Bot. v. 15. t. 1072.

Gram. Brit. t. 54. Gram. Aust. v. 2. t. 62.

Cat. Syst. Dub. 23.

Has obtained many names in England—seed-shops *bird-grass*—additional scientific and common distinctions between this and the former—flourishes luxuriantly in water-meadows and the flowings from springs—particularly fond of sheltered situations—generally considered as one of the best grasses—leaves highly acceptable to cattle, &c.—Young's Annals—in many of the volumes much recommended—the circumstances in its favour considered, or epitomized.

Seeds when ripe soon drop—from its roughness, the leaves, &c. much covered with them, joined to the interposition of the cobweb downy substance, which in this species is more abundant—difficult to separate it—therefore not easy to diffuse the seed uniformly—methods tried to separate the connexion.—Formerly supposed to be the famous Salisbury Orcheston grass—not so—Mr. Maton,

5th vol. Linn. Transactions has cleared up all doubts—the meadow composed of many other grasses—two acres and a half afforded ten tons of hay in one year!—Mr. Maton's reasoning on the fertility of this spot conclusive—e. g.—The late Doctor Withering's ingenious observations—deserve much attention—throw a new and interesting light on the subject.

Doctor Richardson condemns this grass as the worst he tried—his reasons—highly honourable and candid.*

Po'a an'nua,

Annual meadow grass, common dwarf poa, Suffolk grass.

Irish name, CUISE BLIADHAINTEA.

Fl. Rust. t. 98. Eng. Bot. v. 16. t. 1141. Fl. Lond. v. 1. t. 8. Gram. Brit. t. 52. Gram. Aust. v. 2. t. 64. Cat. Syst. Dub. 23.

Though an annual, continues to throw up fresh flowering stalks for a very considerable length of time—flowering and seeding incessantly—differing from all annual grasses—imitates tropical plants—perhaps the only vegetable with us, that does? Foliage tender and very grateful to cattle—the late Mr. Curtis's opinions.

In

* The author of this Sketch is not aware, that the Doctor has published any new edition of his interesting Elementary work.

In laying down a field, it would be well to have a large portion of the seed mixed with other grasses—advantages gained by the practice.

Flowers in the spring, smell like *Rafeda odorata*, or mignonette—the fragrance continues, even when they are dried—difficult to collect the seeds—causes.—Society for the encouragement of manufactures, &c. London—premiums for the cultivation of this grass.—High Suffolk—whole fields of it, without any other admixture.—Young's Annals, 6th volume—particularly recommended for cows—consequences.

Whether dividing and transplanting, or sowing the seed the best method of cultivation?

Poa aquatica.

Water meadow grass, reed meadow grass, large water poa.

Irish name, CUISE CUILCAMHUIL.

Fl. Lond. v. 2. t. 335. Eng. Bot. v. 19. t. 1315.

Gram. Brit. t. 44. Gram. Aust. v. 2. t. 60.

Tallest of all the species—often five or six feet high—luxuriant late in autumn—perhaps not to be placed among the esteemed grasses? sweet, nutritive, and liked by cattle. Withering—all animals

animals exceedingly fond of it. Lands and situations, in which its growth should be encouraged—richness of the crop at times astonishing—best as hay for packing—a substitute for straw—leaves subject to be diseased—the disease described.

Poa, or Festuca fluitans,

Floating poa, or flote fescue grass.

Irish name, CUISE SNAMHUIGHILL.

Fl. Lond. v. 1. t. 36. Fl. Rust. 113. Eng. Bot. v. 22. 1520. Gram. Brit. t. 45. Gram. Aust. v. 2. t. 77. Cat. Syst. Dub. 27.

Early in the year expands itself over the surface of our ditches and still waters—in certain situations abundant and interesting—interesting to see the poor hungry beast wallowing in search of this sweet and early spring bite—swine are fond of it!—a few hints as to irrigation—the present grass and some others, as natural exemplifications of the necessity of the practice—practical remarks adduced.

Seeds sweet and nutritious—collected in Poland and Germany—considered as a very agreeable and nutritive addition to their soups and gruels—meal of them little inferior to wheat—bran given to

to horses, when molested with worms—favourite food of geese—contrary to a generally received opinion, their germinating powers are full as vigorous as those of many other grasses.

Doctor Richardson in a late and short “Essay on the improvement of the great flow bogs of Ireland, particularly the bog of Allen and the Montags in the north”—called drain grass—very common in the bogs—amongst some other particulars, this highly respected, and pains taking enquirer recommends it in its ratio with other grasses for reclaiming wet bogs.

Po'a dis'tans, vel retroflexa,

Retroflexed, or reflexed meadow grass.

Irish name, CUISE SGAOLTEBHLAITHACH.

Fl. Lond. v. 2. t. 361. Eng. Bot. v. 4. t. 986.

Gram. Brit. t. 47. Gram. Aust. v. 2. t. 63.

Pl. Rar. Hib. 8.

Has not been as yet subjected to agricultural tests—would it be valuable on low, moist, maritime situations?—in the neighbourhood of Dublin, with certain advantages, has produced abundant foliage in such situations.

Aira

Aira aquatica,

Water hair grass.

Irish name, GRUAGFHEUR UISGE.

Fl. Lond. v. 1. t. 60. Eng. Bot. v. 22. t. 1557.

Gram. Brit. t. 29. Gram. Aust. v. 2. t. 41.

Cat. Syst. Dub. 20.

Alex Hippocrates and Theophrastus.

Common on the margins of rich pools and standing waters with *Poa fluitans*—in such situations the only species affording animal food—frequently producing abundant foliage—sweet and juicy—claims further attention.

Aira cespitosa,

Turfy hair grass.

Irish name, GRUAGFHEUR SGRATHOGHA.

Eng. Bot. v. 21. t. 1453. Gram. Brit. t. 33.

Gram. Aust. v. 2. t. 42. Cat. Syst. Dub. 21.

A tendency to grow in tufts in cavities in moist meadows—leaves roughest and coarsest of all meadow and pasture grasses—not liked by cattle—ought to be got rid of—means.

Mili^{*ca*}

Meli'ca cæru'lea,

Purple melic.

Irish, MELOIGFHEUR CORCUIR.

Fl. Lond. v. 1. t. 60 Eng. Bot. v. 22. t. 1557.

Gram. Brit. t. 40. Gram. Aust. v. 2. t. 8.

Cat. Syst. Dub. 20.

Common in deep, spongy boggy situations—grows in other soils—varies accordingly—a very late grass—Ray *gramen serotinum*—substitute for Indian rush—made into twine and much valued by the Continental fishermen—not much affected by water.—Pennant—2d v. Wales—a curious fact of purple melic.

Arun'do phragmi'tes,

Common reed grass.

Irish, CUILE CRUISGIORNADH.

Eng. Bot. t. 401. Gram. Brit. t. 95. Cat.

Syst. Dub. 31.

Arundo, from *Areo*, because it becomes dry—in Greek, *καλαμος*.—In rivers, ditches, and lakes—in rural economy has its uses—constitutes the crop of the soil in many low lands in
c England

England—used as thatch—very durable.—Eager attachment, which the bird called the Starling* has to this reed—astonishing—a curious and interesting fact—extraordinary circumstances attending their violent passion for it—bushels of them destroyed by the farmers of the watery districts in one night to save their reed.

Arun`do arena`ria,

Sea mat weed, sea reed grass, marram, helm.

Irish name, CUILE MUIRIUNATH.

Fl. Rust. 32. Eng. Bot. v. 8. t. 520. Gram. Brit. t. 99. Cat. Syst. Dub. 31.

Abundant in loose drifting sands in maritime boundaries—opposes and prevents the conflux of drifting dry sands, which threaten inundation—roots woody—collected for fuel—ruinous and melancholy consequences have ensued—the drifting sands meeting with no opposition—nearly a whole parish in Scotland has been destroyed—at Farres in the county of Elgin so great, houses and trees buried from the sight—coast of Norfolk—this mat grass almost alone stays the violence of the German ocean—other instances. Acts passed to prevent its destruction, and to encourage its growth

—27th

* *Sturnus vulgaris.*

—27th of Elizabeth—15th of George II.—
General observations on the subject—may be ma-
nufactured into mats and ropes.

Elymus arena'rius,

Sea mat weed, great lime grass, upright sea lime
grass.

Irish, AOLFHEUR MARA.

Fl. Rust. 31. Eng. Bot. v. 24. t. 1672—Gram.
Brit. t. 108.

Elymus *ελυμος* of Dioscorides, from *ελω*,
involve. Has it been found in the loose
sands on the sea coasts of Ireland?—From
the great strength of its roots, &c.—a more
effectual resister to drifting sands than the former
—many shores in England examined without find-
ing a single specimen.

Festuca pratens'is,

Meadow fescue grass.

Irish, FESCUFHEUR LEANA.

Fl. Lond. v. 2. t. 393. Fl. Rust. t. 84. Eng.
Bot. 23. t. 1592. Gram. Brit. t. 73. Cat.
Syst. Dub. 27.

In moist and low meadows common—carefully to

be distinguished from tall fescue grass,* which under cultivation *seldom* perfects its seed—liolaceous fescue† *never*—both hybrids—meadow fescue the original stock—proofs—produces much good herbage, and placed among the best grasses—may supply any deficiencies in ray grass—hitherto not recommended except by the Farming and Dublin Societies.—Seeds easily gathered, abundant, and grow readily—vegetate almost immediately after they are sown—Young's Annals, 20th vol.—many interesting remarks, Mr. Majendie—"to be classed with the most valuable grasses we possess"—relative value between it and fox tail grass considered.—"County Derry Statistical Report" seldom met with in the county Derry. "Down Report"—very well worth cultivating in moist clays—allude only to *Festuca elatior*—again "Down Report"—*F. pratensis* one of the best for pasture and hay. Doctor Richardson—a fine meadow grass, luxuriant growth, abundant foliage—further remarks by this gentleman.

Festuca

* *Festuca elatior* Fl. Lond. v. 2. t. 392. Eng. Bot. v. 23. t. 1593. Gram. Brit. t. 73. Gram. Austr. v. 2. t. 79? Cat. Syst. Dub. 28.

† *Festuca loliacea*. Fl. Lond. v. 2. t. 394. Gram. Brit. t. 74.

Festuca ovina.

Sheep's fescue grass.

Irish, FESCUFHEUR CAORACH.

Fl. Rust. t. 102. Eng. Bot. v. 9. t. 585. Gram.

Brit. t. 66. Gram. Aust. v. 2. t. 84. Cat.

Syst. Dub. 25.

Common on very dry pastures, and on sandy hillocks exposed to the sun—leaves resemble bristles growing on very poor soils—is it the favourite food of sheep? doubted by some experienced farmers—is the fineness and superiority of English and Spanish wool attributable to the sheep feeding on it?—some high authorities to support its being the favourite food of sheep—Linnæus the first, who perceived the predilection—Flora Suecica—sheep no relish for such hills and heaths as are without it—Gmelin—Flora Sibirica—Tartars choose such spots as abound with it—they observe that it is highly nutritious, and grateful to their wandering sheep.

The superior fineness of the Spanish wool?—great heat makes wool hairy—cold gives a coarseness—peculiar treatment of the animal—in the heat of summer the sheep feed in the northern provinces of Spain—in winter in the southern provinces—further remarks on this subject.

Late

Late Mr. Curtis no favourable opinion of it—recommends it for forming fine-leaved grass plots—a few more interesting observations by this much to be lamented character.—Common distinctions between *F. ovina*, and *duriuscula*, to which it bears a strong resemblance.

Doctor Richardson's opinions against this grass—not hastily to be acceded to.

Festuca duriuscula,

Hard fescue grass.

Irish, FESCUFHEUR DURUNTA.

Eng. Bot. v. 7. t. 470. Gram. Brit. t. 68. Gram. Aust. v. 2. t. 83. Cat. Syst. Dub. 26.

Generally found in upland and dry situations, crevices of walls, and fissures of rocks—considered as most excellent in mountainous pasture grounds—less injured by drought than any of the pasture grasses—sheep extremely fond of it—supports them well in rigorous seasons—should not be introduced into low lands and meadows—in arable lands injurious in the highest degree—frequently springs up with the corn—sometimes overpowers it, and occasions the grain to be poor in quality.

Avena

Avena elatior,

Tall oat grass.

Irish name, COIRCE AIRDE.

Fl. Lond. v. 1. t. 192. Fl. Rust. t. 7. Eng. Bot.
v. 12. t. 813. *Holcus avenaceus*, Gram. Brit.
t. 39, *Holcus avenaceus*. Gram. Aust. v. 2.
t. 49. Cat. Syst. Dub. 30.

Avena—supposed to be from *aveo* to desire or
covet; cattle being fond of it.

Frequently to be met with—some meadows
abound with it—Doctor Smith's reasons for re-
moving it to the genus *Holcus*—Gmelin first adopt-
ed the change—such high authorities presumptuous
to oppose—perhaps, however, it would be well
to let old established, and commonly received names
remain?—Though a perennial, produces flowering
stalks the first year it is sown—proof by experi-
ment.—Very conspicuous—tallest of the pasture
grasses—seeds to be gathered at the critical time
of their ripening—roots sometimes troublesome in
arable land. Mr. Curtis—in value comes near
to foxtail grass.—Annals of Agriculture, 12th
volume—an excellent and valuable grass, &c.—
Down Reporter—good grass for hay, and amongst
the most productive.

Avena

Ave`na flaves`cens,

Yellow oat grass.

Irish name, COIRCE ORFOLLTACH.

Fl. Lond. v. 1. t. 206. Fl. Rust. t. 112. Eng.
Bot. v. 14. t. 952. Gram. Brit. t. 89. Gram.
Aust. v. 3. t. 38. Cat. Syst. Dub. 30.

In most parts of the kingdom, forms a principal part of the finest pasturage—one of the least of the oat grass tribe—meadows, abounding with it, considered valuable—flourishes most on calcareous soils—bids fair to form good sheep pastures.

Doctor Richardson warmly recommends it as an early meadow grass—further observations, by this gentleman, on yellow oat grass.

Ave`na pubes`cens,

Pubescent, or rough oat grass.

Irish name, COIRCE CLUIMHADH.

Eng. Bot. v. 23. t. 1640. Gram. Brit. t. 90.
Gram. Aust. v. 2. t. 50.

Bears some similarity to the last—foliage bitter—panicles shining and silvery, tinted with purple—
perhaps

perhaps the bitter principle of its foliage serviceable to cattle?

Dac'tylis glomer'ata,

Rough cock's foot grass.

Irish name, CAOLACHOSFHEUR COITCHION.

Fl. Rust. t. 14. Gram. Brit. t. 62. Gram. Aust. v. 2. t. 94. Cat. Syst. Dub. 25.

From *Δακτυλῖς*, digitalis—spikes long and slender, like the finger—English name—inverting the flowering heads—some idea of a cock's foot.

Not the true American orchard grass some years back so valued in England.—Almost all situations produce it—singular attachments—drippings of large trees so injurious to many, grateful to this grass—its value as a meadow and pasture grass fully considered—the late Mr. Curtis's opinion—"Statistical Report of the County of Down"—Mr. Templeton—high and valuable authority—cock's foot grass, worthy of cultivation and liked by horses—Mr. Dubourdieu, the ingenious and learned author of the Report—horses and cows eat it greedily—the principal grass in the famous meadows about Lisburn—further remarks by this gentleman.

“Kilkenny

“Kilkenny Reporter”—a gentleman of very extensive knowledge and erudition—the result of his observations materially different—“*good for little, and that cattle will eat round it, and never touch it willingly!*”—some reasons offered to reconcile such different observations.

Doctor Richardson—seems inclined to think well of it—grounds of his opinion—merit attention.

Bro'mus mol'lis,

Soft brome grass, field brome grass, or soft broom grass.

Irish name, BRUMFHEUR BOG.

Fl. Rust. t. 99. Fl. Lond. v. 1. t. 17. Eng. Bot. v. 15. t. 1078. Gram. Brit. t. 77. Gram. Aust. v. 1. t. 19. Cat. Syst. Dub. 28.

From *Βρῶμα*, esca, food.

Various opinions as to its merits—in many fields at mowing time, it would appear to form almost the whole crop—cause—an early biennial—Mr. Curtis says it is undoubtedly an annual—further remarks on this grass by Mr. Curtis.

Seeds are like corn—of some species mixed with corn, and made into bread—apt to disagree with the stomach and head.—Can be easily collected in large quantities.

Farmers

Farmers in England do not recommend this grass—cattle not attached to it in a recent, or green state—sown with clover—its merits, or demerits not satisfactorily ascertained—as a spring grass perhaps it might be cultivated with advantage?—“Down Report”—a circumstance as to its value as a hay grass—English Dragoons paid ten shillings a ton more for hay, which appeared to contain most *Bromus mollis*.

In certain parts of Scotland, cultivated as ray grass is with us.

Doctor Richardson's practical observations on this grass—interesting, and should be attended to.

Agrostis vulgaris,

Fine bent grass.

Irish name, TAENFHEUR COITCHION.

Eng. Bot. v. 24. t. 1671. Gram. Brit. 26. Cat. Syst. Dub. 19.

Agrostis, Theophrastus and Dioscorides, from *αγρος*, a field.

Late Mr. Hudson not inaptly placed the trivial or specific name *polymorpha* to some of the common species, considering them as varieties—in an agricultural point of view would be perhaps the best term? Fine bent grass considered by some
as

as the best of the tribe—abundantly on all dry, heathy, elevated sandy soils—comes in late—perhaps among the best of the tribe for cultivation?—reasons.

Mr. Young—Annals of Agriculture, v. 17. p. 28—his opinion of this grass.

Agrostis alba,

Marsh bent grass.

Irish name, TAENFHEUR BAN.

Eng. Bot. v. 17. t. 1189. Gram. Brit. t. 28. *A mutabilis*.

Agrostis palustris of most agricultural publications.—Mr. Kapp's specific name *mutabilis* justifies Hudson's *polymorpha*—further justification of the terms.—In a botanical point of view—difficult to discriminate the specific differences—the late Mr. Curtis's excellent remarks on this head.

It is rather common in low meadows, the vicinity of rivers, and wet ditches—propagates itself by runners, like strawberries. Some English farmers not partial to it—called *fog* in the west of England.—Some circumstances in its favour.—Bath Papers, v. 9. 132—recommended as a good grass for wet meadows and pastures, where better would not thrive.

Agrostis

Agro'stis stolonifera.

Creeping bent grass.

Irish name, TAENFHEUR FORIN.

Fl. Rust. t. 120. Eng. Bot. v. 22. t. 1532. Gram.
Brit. t. 27. Cat. Syst. Dub. 19.

Engages much attention at the present day—
necessary to be pretty full on it.

English farmers, a troublesome couch—black
squitch—difficult to separate the roots from clayey
arable land—for a long time supposed to be the
famous Salisbury Orcheston grass—not so, as
proved before.—“County of Down Statistical
Report”—the joint grass of the farmers, and in
moist situations one of the most valuable—the
learned author of the Report considers it as one
of the most beautiful, and best.

The “Kilkenny Reporter”—the commonest
scutch, or couch they have.

“Derry Report”—hay formed of a full crop
of this grass—at Myroe *fiorin* or joint grass—
after all cropping, natural *fiorin* spreads a rich
mantle of green—its hay preferred to all others.

“County of Tyrone Report”—some circum-
stances highly worthy of attention—the indus-
trious

trious author recommends hay water, particularly such as abounds with this grass, (which the natives call *foreen*) for increasing the milk in cows—has shot above twenty feet in the season, producing abundance of roots from every joint—in rich bogs, joints farther apart than in barren.

Doctor Richardson, in his late “Essay on the improvements of the great bogs of Ireland,” seems to hope, that by the aid of *Agrostis stolonifera*, which he calls fiorin grasses, he may be enabled to convert the boggy and heathy mountains into fattening meadows and pastures.* Some further proofs adduced by the Doctor in favour of fiorin grass—corroborate the facts mentioned by Mr. M’Evoy, in his Statistical Report of the County of Tyrone, published in 1802.

Hol'cus

* I ascertained the true *Agrostis stolonifera* for this praiseworthy character in June 1806, by sending him some very perfect recent specimens.

Holcus lanatus,

Meadow soft grass, short awned holcus, white hay-feed grass.

Irish name, MINFHEUR FADCHALGACH.

Fl. Lond. v. 2. t. 225. Fl. Rust. t. 118. Eng. Bot. v. 17. t. 1169. Gram. Brit. t. 37. Gram. Aust. v. 1. t. 2. Cat. Syst. Dub. 268.

Holcus of Pliny: from *ολκός*, tractus, a furrow, &c.

Common in meadows, pastures, and waste grounds—red panicles appearing, considered as a proper time for cutting hay—from its hoary appearance, called white hay-feed grass—thrives best in very light porous soils—turfy ground particularly suited to it. The chaff proportionally exceeds the quantity of seed, from a particular economy, and conformation in the flowers—explained. Mr. Curtis's opinion of this grass—with some few exceptions to it, may rank amongst the best.—The great Haller, *optimum pabulum*. English farmers, too soft, and too woolly—however collected as pure grass—Yorkshire grass—considered by some as unfit for horses, being soft and spongy.

Doctor Richardson considers himself as singular in reckoning it among the very best grasses—his reasons—satisfactory and clear.

Convincing

Convincing scientific distinctions to the botanist, between this, and the next, *H. mollis*.

Holcus mollis,

Corn soft grass, creeping soft grass, long awned holcus.

Irish name, MINFHEUR BIRCHALGACH.

Fl. Lond. v. 2. t. 320. Fl. Rust. t. 119. Eng. Bot. v. 17. t. 1170. Gram. Brit. t. 38. Gram. Aust. v. 1. t. 3. Cat. Syst. Dub. 268.

Very similar in some respects to the former—less frequent—grows in a different kind of situation—corn-fields, copses, and hedges—a very creeping root—one very evident mark of distinction—difficult to eradicate—a more slender plant—less downy—flowers larger—colour of the panicle, a dirty white green.—Further distinctions—produces more seed—cause.

Universally considered as a bad grass.—Mr. Curtis—grows well on a sandy soil—bears the drought of summer better than most grasses.

Statistical Reporters, in general, don't seem to know any distinction between the *lanatus* and *mollis*—how necessary is botanical knowledge to the farmer!

“ County

“County of Tyrone Report”—white meadow grasses, being most prevalent, are most sought after.

“County of Derry”—is that generally sown.

“County of Down”—white hay-feed, so much praised in the county of Down, neither good for meadow or pasture, Mr. Templeton—the author of the Report seems to think it peculiarly grateful to cattle.

Holcus odoratus,

Sweet scented Holcus.

Trans. Dub. Soc. p. 222, 1804, with a figure.

De Holco odorato, 4to, cum icon. 1804. Gram.

Aust. v. 3. t. 3, *Holcus repens*.

A most correct and splendid figure of this new grass occurs in Host's Austrian grasses, under the title of *H. repens*, creeping holcus—very distinct from the *H. odoratus* of the same work, v. 1. t. 4. No name more appropriate, being as spreading as the most rank couch we have—as yet not sufficient experience of its value—native of Siberia, Canada, and the North of Europe.—Gmelin Flora Sibirica, p. 100, 101—*Hierocloe*, holy grass—whether does Gmelin mean the *repens* or *odoratus*? both being equally fragrant. Host speaking of the *repens*, “*Tota planta nec vi nec*
D *suavitate*

suavitate odoris cedit holco odorato."—Walstein and Kitaibel, who have so highly distinguished themselves by their Hungarian Flora, tell us, that *H. repens* is to be met with frequently in the cultivated and uncultivated sandy grounds in many parts of Hungary, flowering in April—with us the latter end of March.—A curious fact—has not been known to produce seeds at Glasnevin—further remarks from observations made on it in the Society's Botanical Garden.

Panicum dactylon,

Creeping panick grass.

IRISH, PANSIGFHEUR BUNSNAIGHEACH.

Fl. Rust. t. 77. Eng. Bot. v. 12. t. 850. Gram.
Brit. t. 13. Gram. Aust. v. 2. t. 18.

Noticed more on account of some curious circumstances mentioned of it, than any agricultural merits, it perhaps possesses?

The famous *Durva*, of the Hindoos, figured in the 4th vol. of Asiatic Researches, and so celebrated by the late Sir William Jones for the beauty of its flowers and nutritious quality, as pasture for cattle; nothing more than *Panicum dactylon* of the Cornish shore, *Lambert, Linn. Trans. v. 6.* "Its flowers in their perfect state

state are among the loveliest objects in the vegetable world, and appear through a lens, like minute rubies and emeralds in constant motion from the least breath of air. It is the sweetest and most nutritious pasture for cattle, and its usefulness added to its beauty induced the Hindus, in their earliest ages, to believe that it was the mansion of a benevolent nymph. "Even the Veda celebrate it—may *Durva*, which rose from the water of life, which has a hundred roots, and a hundred stems, efface a hundred of my sins and prolong my existence on earth for a hundred years." *Jones in Asiatic Researches*, "Botanical Observations on Select Indian Plants." vol. 4, art. 11. *Durva*, p. 248 & 249.

CONCLUSION.

From a *few* experiments and observations on so important a subject—unwise and presumptuous to give any decided opinion as to the respective value of the different grasses, as compared with each other—to justify such a decision, or to ascertain their real merits or demerits—experiments should be numerous, enlarged, and diversified—various soils, various seasons, various situations, influence in a remarkable manner the vegetable world—sometimes change the nature of grasses—mislead as to the taste of animals.

How to manage experiments on the meadow and pasture grasses, and the feeding of cattle.—Shameful and reprehensible, how hay-seeds are at present collected and sold—proofs—measures adopted by the Dublin and Farming Societies to obviate in some degree the present slovenly method of laying down land to grass—have not been attended to by the public as they should.

Whether introducing more than 5 or 6 of the grasses noticed, might not be attended with difficulty, create confusion, and ultimately be of no benefit?

1. Sweet

1. Sweet scented vernal. 2. Meadow fox-tail.
3. Smooth stalked meadow. 4. Rough stalked
meadow. 5. Meadow fescue. 6. Crested dog's
tail—lands, for which they are best adapted.

Directions for sowing the seeds—proportions
adviseable, and the best means of extending the
cultivation of the valuable meadow and pasture
grasses by the late ever to be revered Mr. Curtis*
—highly interesting, and should be attended to.

Further reflections on the subject, from atten-
tive consideration and observation—from the small
number retained as pasture grasses, to gain the
full value of them, assort them to their particular
situations—high grounds with a thin, stony, gra-
velly soil, or sandy understratum—pasturage
for sheep—on such grounds *Anthoxanthum odo-
ratum*, sweet smelling vernal—*Lolium perenne*,
ray grass—*Cynosurus cristatus*, crested dog's tail
—*Festuca duriuscula*, hard fescue—*Poa annua*,
annual poa—perhaps the best grasses?—propor-
tions—

1 part *Anthoxanthum*—early—ewes require it
to

* An elegant botanical writer of the present day, speaking
of Mr. Curtis, “ Let an insignificant mortal breathe one sigh
of gratitude for infinite information to the memory of the
late Mr. Curtis ! a King in a realm of botanists ! amidst my
various rambles through the regions of the vegetable world,
wherever I have found the traces of his footsteps, so have I
invariably seen them accompanied by judgment, learning, and
accuracy.”

to increase their milk—affords tender herbage for the infant lambs, &c.

3 parts *Lolium*—early and substantial—sheep and lambs flourish on it—good autumn food, &c.

2 parts *Cynofurus*—why a valuable addition.

2 parts *Festuca*—endures drought better than other pasture grafs—sheep eat it with marked avidity—&c.

2 parts *Poa*—furnishes excellent food in the autumnal and spring months—&c.

In meadow and low lands, with a deep retentive soil—very different grasses—resort to such lands for our hay and after-grafs for the larger cattle—proportions difficult to ascertain from various causes—stated—best grasses for such purposes—*Poa pratensis*, smooth stalked meadow, *Poa trivialis*, rough stalked meadow, *Alopecurus pratensis*, fox-tail, *Dactylis glomerata*, cock's foot, *Phleum pratense*, cat's tail, *Holcus lanatus*, white hay-feed, and *Lolium perenne*, ray grafs. *Festuca pratensis*, meadow fescue, may perhaps be an useful additamentum?—some objections to it.

In our mountainous moist pastures, *Agrostis stolonifera*; creeping bent, *Agrostis vulgaris*, fine bent, *Agrostis alba*, marsh bent, towards autumn furnish a large proportion of food—further particulars in recommendation of the bent tribe.

In the Philosophical Transactions for 1799, Mr. Tennant a chymist of the first reputation—magnesian

nesian lime-stone—extremely injurious to vegetation—of common occurrence in certain counties in England—means of ascertaining magnesian lime-stone—in England called hot lime-stone.

Mr. Davy that highly celebrated character, professor of chymistry and mineralogy to the Royal Institution, London—differs somewhat in opinion with Mr. Tennant as to the properties of magnesian lime-stone—by a communication made to me in 1806, by my respected friend Mr. Davy, when he visited Ireland—used in Leicestershire, Derbyshire, and the North of England generally—on common lands in much smaller quantities than common lime-stone—rich soils with less caution—peat or turfy soils in any quantity—specimens exhibited—found near Ballyshannon—about Caltra, near Belfast, and in the midland mountains near Donegal.

Distinguished from common lime-stone, by being much slower of solution in nitric acid, and by rendering it milky. DAVY.





SKETCH
OF
LECTURES
ON
ARTIFICIAL OR SOWN GRASSES,
AS
LUCERN, SAINT-FOIN, CLOVERS, TREFOILS,
VETCHES, &c. &c.
DELIVERED IN THE
DUBLIN SOCIETY'S BOTANICAL GARDEN,
GLASNEVIN.

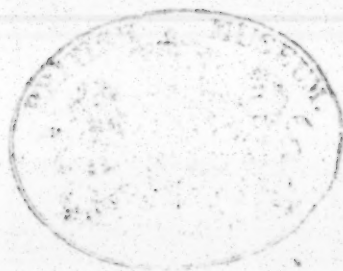
BY
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IRELAND; PROFESSOR AND LECTURER ON BOTANY TO THE
ROYAL COLLEGE OF SURGEONS IN IRELAND, AND TO
THE RIGHT HONORABLE AND HONORABLE THE
DUBLIN SOCIETY.

—●●●●●—
“ Hinc fessæ pecudes pingues per pabula læta
Corpora deponunt, et candens lacteus humor
Uberibus manat distentis.” LUCRETIVS.

—●●●●●—
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—
1808.



PREFACE.

THE nature and composition of soils being at this day more properly understood than formerly, and the effects of the various substances, that are used in cultivation, being more clearly defined by our knowledge, and a just application of other sciences, particularly chymistry and botany; extensive improvements have taken place in the important business of tillage; however a great deal more yet remains to be effected in almost every branch of husbandry, particularly in this kingdom; for, we must see, that a very trifling portion even of the cultivated part of Ireland has at this enlightened period been managed judiciously and profitably; many parts exhibit extensive tracts of rich and fertile land, which, it is much to be regretted, are very defectively and unskilfully conducted. Even in Great Britain, where riches and wealth so much abound, that able and judicious writer, Sir John Sinclair, states “ that Great

Britain contains sixty-seven millions of acres, seven millions of which are taken up by houses, roads, rivers, lakes, &c. and consequently incapable of cultivation; and that, of the remaining sixty millions, only five millions are employed in raising grain, and twenty-five millions in pasturage, *while thirty millions are either in a state of waste, or cultivated under a very defective state of husbandry.*" This defect we may fairly attribute, in a great measure, to a want of a better and more complete knowledge of the different branches of science, which are closely connected with agriculture among practical farmers; and it is lamentable to observe, that the very slow progress, which many useful arts have made, proceeds from a want of that coalition, which should subsist between scientific and practical men; the latter too frequently holding in contempt the speculations of the man of science, whilst the former has most reprehensibly looked upon the simple practitioner with indifference. The highly important art of husbandry, amongst other arts, has suffered heretofore materially by this circumstance, the want of a proper intercourse and communication of sentiment between both parties.

But

But it is to be hoped, that the scene is now changed, and that agriculture, the first and the most useful of all the arts, is fixed on a firm foundation, by establishing it on rational and philosophical principles. We have every reason now to expect, that the profession of agriculture will be as honourable amongst us, as it was once amongst the ancient Romans; since some of the first-rate and most distinguished characters in the land, as to talent and station, have condescended to turn their thoughts to the important object of agriculture.

The interest, which the Dublin Society has, upon all occasions, evinced to unite science with agriculture, rural economy, and the useful arts, must, by this time, be gratefully acknowledged and felt by the public—they have directed their different professors to disseminate their knowledge in their respective capacities on the most extended, liberal, and useful plan of education, in order that science may go hand in hand with the useful purposes and accommodations of life, and, if possible, to render its various branches intelligible, and of use to the meanest capacity.

CHYMISTRY.

CHYMISTRY.

And first chymistry, which may justly be called the foundation stone of all the arts and sciences, is absolutely necessary for every person engaged in rural affairs to be competently acquainted with; it will furnish him with the best means of preparing nourishment for his respective crops, and enable him occasionally to satisfy himself as to the hidden mysteries of nature—the principles of agriculture depend most highly on chymical knowledge, and without principles what is art, and what is science?

NATURAL PHILOSOPHY.

A knowledge of natural philosophy, or, more properly speaking, mechanical philosophy, will enable the agriculturist to judge of the most proper instruments he should employ in dividing and loosening the soil, an operation of the greatest benefit to the farmer, and besides this knowledge will materially assist him in planning any piece of mechanism, which it may be thought necessary to employ with advantage in rural affairs.

VETERINARY

VETERINARY ART.

Every person should be well acquainted with the veterinary art—for, if our domestic animals, e. g. horned cattle, horses, sheep, swine, &c. nay, our poultry are necessary for our comforts and accommodations, and of which there can be no doubt, the best and most rational plan of reducing into a regular system a knowledge of their structure and functions, the preservation of them in health, an acquaintance with their diseases, and the most likely means of removing them, must be a very desirable, and a highly valuable national object.

BOTANY.

The dependence, which agriculture has on botany, is self-evident, as will be more clearly and satisfactorily proved during the progress of the present sketch, which is to be considered as a summary account, by way of heads, of the most important facts adduced on the interesting subject of
ARTIFICIAL or SOWN GRASSES.

As

As in the “*Sketch of Lectures on Meadow and Pasture Grasses*”—coloured figures of the different objects, noticed in this Sketch, will throughout be referred to.

ABBREVIATIONS

ABBREVIATIONS EXPLAINED.



Fl. Lond. Flora Londinensis.—By Wm. Curtis,
London, 2 vols. folio.

Eng. Bot. English Botany.—By J. E. Smith,
M. D. and James Sowerby, F.L.S. London,
25 vols. &c. 8vo.

Fl. Rust. Flora Rustica.—By Thomas Martyn,
B.D. F.R.S. &c. and Frederick P. Nodder,
London, 4 vols. 8vo.

Cat. Syst. Dub. Catalogus Systematicus Planta-
rum Indigenarum in Comitatu Dublinensi in-
ventarum.—Auctore Gualtero Wade, M.D.
&c. Dublini, 1794, 1 vol. 8vo.

Bot. Mag. Curtis's Botanical Magazine, London,
26 vols. &c. 8vo.

Ast. Decand. Astragalogia—Augustini Pyrami
Decandolle—Parisiis, Ann. 1802.

INTRODUCTION.

INTRODUCTION.

A GENERAL view of what are called papilionaceous, pea-flower, or leguminous plants—a class of vegetables of much importance, and highly interesting in many points of view—for the present, their immediate subserviency to agricultural purposes, and the feeding of cattle in particular.

In the artificial or sexual system of the great Linnæus—belong to a class called Diadelphia, and to the order Decandria of this class—both terms explained—consists of herbaceous annuals, or perennials, or woody, of the tree and shrub kind—generally mucilaginous—afford a clammy liquor, which dries and hardens like gum—some possess dangerous qualities—*Astragalus galegiformis*,* or goat's rue-leaved milk vetch—remarkably caustic.

Abrus precatorius, Jamaica wild liquorice, seeds asserted to be a rank poison?—*Lathyrus sativus*,†
blue

* Astrag. Decandolle, 133. 51.

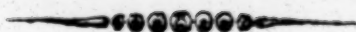
† Bot. Magazine, t. 115.

blue chickling vetch—a native of Spain—extraordinary qualities attributed to it by some of the most respectable authorities—flour of the seeds, made into bread, brought on an incurable rigidity of the limbs—many animals, particularly swine, shared the same fate, by being fed on the seeds of this vetch, or pulse exclusively—edicts issued against the cultivation of it in Saxony and Florence. *Indigofera tinctoria*, Indigo—prohibited during the reign of Queen Elizabeth, &c. as highly poisonous—of a corrosive quality—the chymical decomposition of indigo at this day seems to render it of a very suspected nature.

In general, the plants of this class and order are innocent—many of them very acceptable, nutritious, and valuable food for cattle.

ARTIFICIAL,

ARTIFICIAL, OR SOWN GRASSES.



Hedys'arum Onob'rychis,

Saint-foin, cock's-head.

Irish name, BLASGHEATHUR CODOG.

Fl. Rust. t. 47. Eng. Bot. t. 96.

Ἠδύσχερον of Theophrastus and Dioscorides, from Ἠδύσμα sweetness, and ἄρον ointment.

Never has been found in an actual wild state in Ireland?—on many of the chalky hills in England—has long been cultivated in several parts of Europe for feeding cattle—Mr. Lisle speaks of it in 1703—valuable food for cows—known to produce two tons an acre for fourteen or fifteen years—grows on the poorest soils—the different species and varieties of calcareous soils best suited to—is it the most nutritious food for horses?—Quantity of seed to be sown with clover—“Statistical Report of the County Kilkenny”—flowers afford a very favourite food for bees—other interesting particulars as to the cultivation of saint-foin

foin in the county of Kilkenny—"County Cavan Report"—artificial grasses not successfully cultivated—the reasons, offered for the failure of saint-foin, don't seem to be well founded.

"County of Dublin Report"—Mr. Dutton—Saint-foin little noticed.

Cultivation of saint-foin hardly known in Ireland—highly important to be recognised by the farmer—has many advantages over clover as pasturage—swelling of cattle, who feed on it, does not occur, as in clover.

Ground cannot be made too clean or fine for the reception of the seed—cleansing crops for the purpose—should be sown as fresh as possible—proportion of seed in the broad-cast and drill methods—February or March, in most cases, the best periods for sowing the feeds—most adviseable methods of sowing with this intention.

Experimental cultivators—cut for hay, instead of being pastured—thinner soils seldom cut more than once—deeper kinds two crops—after-grass of saint-foin excellent for weaning and nourishing lambs.

Turf-ashes the best manure—time to put it on—foot found of great utility—proportions to be applied—malt-dust with great success.

In England affords hay of the best and most nutritious quality, and which requires very little trouble in making.

Valuable,

Valuable, as affording a full supply of dry and green food—large in its produce, even on the poorest soils—would it be well to endeavour to encourage its growth on those extensive tracts of land, which yield but a scanty herbage under other modes of cropping?—Not confined in respect to soil, as has been too generally supposed—those of a calcareous and loamy nature the best—stagnant moisture, wet and spongy soils, unfriendly—considerable degree of dryness essentially necessary to the successful cultivation of faint-foin.

Hedys'arum coron'arium,

French honey-suckle.

Irish name, BLASGHEATHUR FRANCAH.

Fl. Rust. t. 115.

May not answer the purposes of feeding cattle on a large scale, as it does not answer the cold of spring well?

Has been much recommended for feeding cattle in the southern parts of Europe—probably of the same qualities, with faint-foin, abundant produce, but not perennial.

A paper by Doctor Symmonds, on the climate of Italy, in the 3d vol. of Annals of Agriculture—

ture—a very interesting account of French honey-suckle—particulars—the remarkable Calabrian horses are chiefly supported by it.

Medicago sativa,

Lucern.

Irish name, MEDICAGA TREABHAMTACH.

Fl. Rust. t. 48. Eng. Bot. v. 25. t. 1749.

May be cultivated with much profit and advantage, as succulent green food, or hay.

Not originally a native of Europe—long time cultivated in the south of Europe—scarcely known in Ireland—Miller—Parkinson—Lisle—Mortimer—Tull—Rocque—their observations.

Particularly recommended for foiling horses, and increasing the milk of cows—Haller's opinion of Lucern.

Wonderfully productive—from about half an acre, eight tons, two hundred, and forty pounds of good fodder—allows of four or five cuttings in the season.

Estimated that one pound of the seed contains 150,000 grains—great latitude therefore for a failure in their vegetative powers—one in three to vegetate 50,000 plants!

Some

Some further instances of immense produce, and its capability of supporting animals, particularly working horses, for a length of time—at first should be given cautiously—acts as a powerful diuretic—sometimes occasions the staggers—pigs devour it greedily!

Soils most suitable to its culture—should not be attempted on such as are retentive of moisture—reasons why—directions for the successful cultivation of lucern—land should be brought into as fine a condition of mould as possible by the usual means.

Seeds of lucern larger, and of a more pale colour than those of clover—perfectly fresh seeds, the most proper for sowing—small seeds, in general, vegetate kindly when new—proportion of seed to be sown—must vary according to the nature of the soil, and other circumstances—from eighteen to twenty pounds broad-cast—drill method considerably less.

Early in the spring months, the most proper season for putting lucern into the ground—seeds very rapid in their vegetation—sooner its rough leaf appears, the better—then out of danger of being injured by the fly.

Manures recommended—clean, well rotted horse-dung perhaps the best?—ashes and foot promote the sprouting up of common plants too much—

much—quantities of manure advised, and the modes of application.

Further particulars on this interesting vegetable.—In the drill method has afforded five full cuttings in the summer at the height of a foot and a half—broad-cast three or four—in foiling must necessarily be different under different circumstances—which for horses, cattle, and swine seems to be the most profitable practice, especially where horses and cattle form a large part of the stock—proportion consumed in foiling cows—care is necessary not to give too much at a time when moist, lest they should be blown with it.

“Statistical Report of the county of Kilkenny”—bees fond of the flowers of lucern—Sir Richard St. George, Bart.—his trials with Cook’s drill machine—the observations on lucern in this Report worthy of attention.

“County of Dublin Report”—Mr. Dutton’s remarks on lucern—seems to hint, that it was formerly much cultivated in Ireland—where?

“County of Sligo Report”—Mr. Wynne has just introduced it (1802) into his farm.

Nothing further on the subject in the different Statistical Reports of Ireland.

George Grierson, Esq.—his communication and practical observations on lucern—highly worthy of attention.

Medicago

Medica'go lupuli'na,

Trefoil medick.

Irish, MEDICAGA DUBHSIOLACH.

Eng. Bot. v. 14. t. 971. Cat. Syst. Dub. 205.

Fl. Lond. v. 1. t. 116. Fl. Rust. t. 19.

In all agricultural writers goes by the name of *trefoil*—distinctions between it and the hop trefoil, and procumbent hop trefoil.—Sweeter food than clover—found on dry hilly sandy banks and pastures—some objections to it as a biennial—quantity of seed to be sown, which may be easily procured, and without much expence—further observations on trefoil—does not injure by blowing cattle, as clover—comes in more early than clover.

As hay does not afford a large produce—but useful in many particulars—seed to be collected in the manner hereafter directed for clover—one acre frequently produces 7 or 8 bushels of clean seed—less valuable as an artificial grass, than clover.

Statistical Reports of Ireland—noticed only by two—Down and Kilkenny—Down—succeeds better than clover on clay grounds—is as cheap as hay-seed and much superior for grazing, or cutting green—Kilkenny—some lands laid down with it, and white hay-seed.

Medica'go falca'ta,

Yellow medick, butter jugs.

Irish, MEDICAGA BUIGHBHLAITHACH.

Fl. Rust. t. 86. Eng. Bot. v. 15. t. 1016.

As a hardy perennial may be worthy of cultivation—has not been found in a wild state in Ireland?—Linnæus early recommended it for feeding cattle—Professor Martyn thinks it may be found to be superior to lucern—the late Doctor Withering's thoughts on the subject.

Medica'go arbore'a,

Tree medick, or moon trefoil.

Irish, MEDICAGA RASCHRANNACH.

Fl. Rust. t. 100.

Never can come into general use—Professor Martyn—high and respectable authority for its introduction—the Professor's reasoning on this head—easily refuted.

The heart of the wood in very old trees as hard as ebony—uses applied to.

Lot'us

Lot'us cornicula'tus,

Bird's foot trefoil.

Irish, UNGEUN COITCHION.

Fl. Rust. t. 53. Cat. Syst. Dub. 204. Fl. Lond.
v. 1. t. 108.

Λωτος of Theophrastus and Dioscorides. From
λωτος sweet.

Common on most of our good pasture grounds—perennial—quality excellent—may be cultivated to good purposes alone—has been mistaken for other plants of the same class.—Mr. Anderson, 1st vol. of his Essays—some judicious and practical remarks on bird's foot trefoil.

Flowers become green when dried—perhaps may afford indigo?

In moist meadows—much higher than the majority of the trefoils—makes choice and substantial hay—may be highly useful for cultivation in lands inclined to be wet.

Anthyllis vulnera'ria,

Ladies' finger.

Irish, LUANFHIATGHAL COITCHION,

Eng.

Eng. Bot. t. 104. Cat. Syst. Dub. 195.

Ανθυλλίς Dioscorides. Ανθηλη flos evadens in lanuginem, or floris lanugo: a downy flower.

Highly worthy of consideration—perennial—extremely common on most of our poor sandy soils—thrives luxuriantly in lime-stone situations—favourable to the production of milk—excellent pasturage for sheep.

Coronilla varia,

Purple coronilla.

Irish, CORONIN IOLDATHACH.

Fl. Rust. t. 15.

Subject to the test of further enquiry—advantages in its favour—a native of many of the southern and northern countries—flourishes with us the whole summer and autumn on any soil—among other leguminous vegetables, may afford abundant and palatable food for our different useful animals?

Galega officinalis,

Officinal goat's rue.

Irish, GABHARUGH LEIGHAS.

Subject to the test of further enquiry and experiment, as the former.

TREFOILS.

TREFOILS.

Trifo'lium re'pens,

White clover, Dutch clover.

Irish, SEAMAR SEAMROG.

Fl. Rust. t. 34. Fl. Lond. v. 1. t. 139. Cat. Syft.
Dub. 201. Eng. Bot. v. 25. 1769.

Τριφυλλον of Hippocrates and Dioscorides. From
 τρεις three and φυλλον a leaf.—Flowers of all the
 species, dried and powdered, have been made
 into bread.

White clover—our Irish Seamrog—common
 through the greater part of Europe—seems to
 come up spontaneously—asbes alone spread on
 land produce it—this commonly received opinion
 preposterous in the extreme.

Affords abundance of succulent leaves and
 stalks—in dry summers highly valuable, affording
 late food, when other plants are dried up.

Seed has been usually imported from Holland
 —the quantity astonishing—one seed-shop has been
 known to sell 50 tons annually—flourishes to a
 great extent under proper care—instances to this
 effect—further examples of its value as food for
 cattle—sheep have been perceived not to be fond
 of

of white clover?—swine don't eat it?—its introduction into England and Ireland of very late date? agricultural writers of the last century don't notice it.

White clover would appear to be a profitable plant on the more rich and dry, sandy, and loamy soils, and on clayey and turfy grounds, well drained from moisture—a proof of good land, that it runs quickly, without assistance to white clover.

Statistical Reports of Ireland—surprising that so little is said on the subject—Down—white clover much sown—Tyrone—no artificial grasses cultivated, except white and red clover with success on a deep bog, which had been cut out; the principal top-dressing soaper's waste.

Trifolium pratense,

Red clover.

Irish, SEAMAR CAPULL.

Fl. Rust. t. 3. Cat. Syst. Dub. 202. Eng. Bot.
v. 25. t. 1770.

A biennial—pretty common in most parts of the world—grows sometimes to a considerable height—affords a very large produce of leaf and blossom—an ameliorating and improving crop—
good

good preparation for wheat crops—cultivated with singular advantage on heavy and dry lands—sometimes on deep gravelly sandy soils—best methods of preparing the ground, on which red clover-seed should be sown, and the crops, with which it should be joined—how to choose the seeds with this intention—should be well ripened and perfectly fresh, of a bright appearance, smells sweet, slides easily through the hand, and the purple-coloured seeds much more abundant than those of the yellow cast—proportion of seed necessary to be sown—must vary and depend upon particular circumstances—enumerated—whether steeping the seed occasionally, particularly in dry seasons, be an advantageous practice?—most proper seasons for putting clover-seed into the ground—must be regulated by the crops, with which it is sown—wheat, oats, barley—months recommended—may be cultivated with advantage in certain soils, without being joined with those of the grain kind—joining ray grass-seed in small proportions with clover seed recommended—advantages gained by the practice—attentions to be paid to clover crops in their feeding state.

Clover crops employed in various ways—as hay—green food—or eating them down—their utility and superiority as hay, and proper time for mowing them—high price of clover seeds, a great inducement for suffering the crops to stand

stand for that purpose—how to manage clover crops with this view—precautions to be observed, and the species of animals admissible, when clover crops are to be eaten on the land—in the feeding down of clovers, the plants and animals are frequently injured—animals by what farmers call *blown*—this distension of the stomach accounted for—best means of avoiding the mischief—the different means advised for removing the disease, when it occurs—common strong salt and water, new milk, &c. tar, stabbing the animal in the flank, (which never should be performed by unskilful hands)—long flexible tubes—in the more early stage of distention, a very strong solution of ammonia (volatile salts) in water has been very confidently recommended—the exact spot, where the perforation should be made in the flank—method of using the flexible tube.

From every authentic report, red clover an object of the highest consideration, where much stock is to be maintained—the chief objection to it—means, by which its duration in the ground can be considerably prolonged.

“Statistical report of the county of Derry”—not above 25 years, since red clover was first introduced there.

Down Report—ashes recommended as the best manure for red clover.

Kilkenny

Kilkenny reporter—but partially sown—not used as green food—succeeds peculiarly well in the county of Kilkenny.

County of Meath Report—in certain districts its use not known—reasons assigned by the author—in other districts its value, as a crop, universally known and acknowledged—sheep not subject to the staggers, when fed upon clover in the spring, and on turnips in the winter.

In the Statistical survey of the county of Kildare, just published, the author, speaking of clover, tells us “that he puts in all his wheat in seven feet beds, covered by the shovel with earth raised by the furrow cutting-plough; when the wheat sowing is finished, he runs the furrow-cutter once in the bottom of each furrow. The stirred earth is left under the frost and winter preparation until the beginning of April. He then sows ten pounds of red clover to the acre on his growing wheat, and a second time shovels the trenches, covering in the clover-feed, and giving the wheat crop *an excellent top-dressing*; by this means he insures a full crop of clover, which he eats off for two years with ewes and lambs, and then, by reversing the beds, break up with oats or wheat.”

Trifolium

Trifo'lium me'dium,

Perennial red clover—marl-grafs—cow-grafs?

Irish, SEAMAR SEANGAN.

Fl. Ruft. t. 2. Eng. Bot. t. 190. Cat. Syft. Dub.
202.

Is it the fashionable cow-grafs?—unquestionably more durable than red clover—Mr. Young's opinion of this perennial red-clover, and the grounds, on which it best fucceeds.—Sir John Sinclair—high authority—of great utility, when fown with other graffes, where the lands are to remain in a ftate of grafs—*true* cow-grafs appears to be very different from this and the laft—perhaps the common *wild* red-clover?—much variety takes place in the broad purple clovers in their wild ftate—Mr. Lifle's obfervations—though made a century back, clear and expreffive on this head.—Cattle not fond of it, till it is touched by the froft?—Withering denies its being the *true* marl-grafs—true marl-grafs—the native wild red clover?

Statiftical report of the county of Tyrone—perennial clover, or cow-grafs, called *horfe fhamrock*—to be met with in ftong foils and cold clays, is very durable and fpreads faft.

Trifo'lium

Trifolium fragiferum,

Strawberry-headed trefoil.

Irish name, SEAMAR SUTHLAR.

Eng. Bot. v. 15. t. 1050. Cat. Syst. Dub. 203.
Fl. Lond. v. 1. t. 93.

Very few remarks necessary to be made on this perennial trefoil—the strawberry-headed-like appearance of its inflated husks, when ripe, readily distinguishes it from white clover.—Mr. Baker, who belonged to the Dublin Society many years back—his observations on this trefoil—borders highly on the marvellous—one—when sown, grows to the length of seven feet!!!—white clover, a much stronger plant, and to be preferred in every point of view.

Trifolium agrarium,

Hop-trefoil.

Fl. Lond. v. 1. t. 161?

Irish name, SEAMAR OBCHEANNACH.

Clearly ascertained not to be indigenous with us—*trifolium procumbens*, or procumbent hop-trefoil, for a long time mistaken for the *agrarium*, which last is a much larger plant—therefore more valuable for cultivation.

Trifolium

Trifo'lium procumb'ens,

Procumbent hop-trefoil.

Irish name, SEAMAR SINE ADH.

Fl. Rust. t. 121. Fl. Lond. v. 2. t. 311. Eng.
Bot. v. 14. t. 945. Cat. Syst. Dub. 203? 204.

Common on dry meadows and pastures—when luxuriant, resembles much the last—as they are annuals, scarcely worth cultivating—however all the trefoils may be considered as valuable—affording good pasturage, and food for cattle.

Trifo'lium melilo'tus officina'lis,

Common melilot trefoil.

Irish name, SEAMAR MELODAGH.

Fl. Rust. t. 72. Eng. Bot. v. 19. t. 1340. Cat.
Syst. Dub. 200.

On ditch-banks in stiff soils—in corn fields, and from which it should be extirpated, being a very bad plant among bread corn—a few seeds, ground with corn, impart a very offensive taste—whole plant a peculiar smell—more fragrant, when dried—distilled water from the flowers improves the odour of other substances—horses remarkably fond

fond of this trefoil—Italian writers—*trifolium caballinum*, horse-trefoil—bees remarkably attached to the flowers.

Shrubby variety, with white flowers—bears repeated cuttings—recommended by Mr. Tighe, in his erudite and scientific “Statistical Report of the County of Kilkenny.”

VETCHES.

VETCHES.

Vicia sativa,

Common vetch.

Irish name, PESSEIR CAPULL.

Fl. Rust. t. 116. Eng. Bot. t. 334. Cat. Syst.
Dub. 198.

Cultivated much—for seed, as green fodder, or an ameliorating crop—fattens cattle and sheep expeditiously—a good preparative for grain crops—advantages gained by the practice—amongst others, waste lands, &c. rendered by many degrees more valuable.

Distinguished into winter and spring vetch—is the latter less hardy in its habits than the former? no botanical difference between the two—various experiments to ascertain the difference in respect to hardiness—a few, as communicated by Mr. Young—result—a material difference in the natural qualities of the two varieties.

Seeds alike in every external characteristic—is there a difference on the appearance of the blade?—seed leaf of winter vetch, fresh green colour?—spring, of a brown dusky hue?—Vetches grow
without

without difficulty on all the various soils—flourish vigorously on gravelly loams not too wet.—Granting there is a difference in the constitution of the two varieties—should therefore be kept distinct—liable to be mixed in the seed-shops—the cultivator ought to preserve his own seed to insure his crop—steeping the seed in dry seasons accelerate vegetation?—Quantity of seed to be sown—according to the nature of the soils, methods adopted, and many other circumstances.—Periods of sowing—winter sowings between September and October—reasons why—spring sowings, from the beginning of March to the end of April—sooner the better—advantages gained.—Methods of sowing—mostly broad-cast—attentions requisite in the performance.

Making vetches into hay—management necessary—of the most nutritious quality—green vetches, about twelve tons an acre!—made into hay, about three!—undoubtedly large—reasons assigned for this large produce.—Produce of seed an acre—sometimes from three to six sacks—forty English bushels have been obtained.

Vetches, supposed to support more stock, as hearty and nourishing food, than any other vegetable—instances adduced—hogs foiled upon them, without any other food—cows give much milk, and more butter, when fed with them, than with

any other food whatever.—Vetches, excellent preparation for wheat on certain soils.

“County of Kilkenny Statistical Report”—vetches very little sown.

“County of Meath”—species of vetches numerous!—winter, should be sown from August to October—practical observations on winter and spring vetches—time for cutting—when the pod begins to form, and while the blossoms remain on the stem.

“County of Dublin Report”—Mr. Dutton, with great justice, seems surprised, that the difference between spring and winter vetches is not clearly known—facts with respect to their respective vegetative powers at certain seasons—cut both ways.

“Statistical Survey of the County of Kildare,”
 “Vetches promise to be of the greatest use in agriculture, as they will grow in the poorest and most exhausted stubble. They certainly check all annuals, and leave the ground in an apparent good state for wheat. Vetches should be put into three feet drills, which admit of the intervals being frequently stirred; the landing of them will strengthen and support; the admission of air in the intervals will keep the plants sweet and nutritious as food, and prevent the mouldiness, which is a constant attendant on the broad-cast way.”—And again, in the same Survey, p. 176,
 there

there appears to be a very interesting, and full communication “ *On the culture of Vetches.*”

Vi'cia se'pium,

Bush vetch.

Irish name, PESSEIR DUBH.

Eng. Bot. v. 22. t. 1515.

As a perennial, an evergreen, and very productive, would appear to be very proper to intermix with grass-seeds for laying down lands intended for pasturage—palatable to cattle of every species—shoots more early in the spring than any plant eaten by them—vegetates late in the autumn—green all the winter—other circumstances in its favour.

Difficult to collect the seed—causes.

Bath Papers, 3d. vol.—cut five times in a year—under nice cultivation, produced at the rate of twenty-four tons an acre green food—dried, four tons and a half—perhaps difficult to cultivate on a large scale?—reasons assigned.

Appears to thrive best on clayey soils—abounds much in foliage—seeds similar to our common vetch.

Vicia cracca,

Tufted vetch.

Irish name, PESSEIR BADANACH.

Fl. Lond. v. 2. t. 319. Fl. Rust. t. 117. Eng.
Bot. v. 17. t. 1168. Cat. Syst. Dub. 197.

Very common, running up many of our hedges—very easily cultivated—affords much foliage—might be useful like other vetches made into hay, or used as green food.

In Mr. Dutton's Report, two species of wild vetches, that deserve much attention—*vicia sylvatica*,* wood-vetch, and this.

Both yield abundance of feed.

Lathyrus latifolius,

Broad-leaved pease, everlasting vetchling.

Irish name, FIATGHAIL LEATHANDHUILLEACH.

Fl. Rust. t. 8. Eng. Bot. v. 16. t. 1108.

Yields a prodigious supply, even on a poor soil—a fit object for agricultural experiments—not met with in a wild state in this kingdom?—in
most

* Eng. Bot. t. 79. Cat. Syst. Dub. 197.

most of our shrubberies, frequently climbing many feet high—cattle eat it with much relish—highly nutritious.—Doctor Anderson's opinion of it long since.

La'thyrus pratensis,

Common yellow vetchling.

Irish name, FIATGHAIL LEANA.

Fl. Lond. v. 1. t. 173. Fl. Rust. t. 52. Eng.
Bot. v. 10. t. 670. Cat. Syst. Dub. 196.

To be met with in many situations, as in woods, pastures, &c.—premiums offered for its cultivation in England—excellent food for cattle.—Mr. Swayne's opinion of it—Professor Martyn's queries on leguminous plants in general—Anderson's remarks on this vetchling—worthy of attention. Mr. Young seems to think well of it.

“Kilkenny Report”—presence of this plant, evidence of a good soil—common in the best grounds—should be introduced into cultivation.

O'robis

Orobis tuberosus,

Heath-pease.

Irish name, CARRAMEILGHE CNAPPACH.

Fl. Lond. v. 1. t. 22. Eng. Bot. v. 17. t. 1153.
Cat. Syst. Dub. 196.

οροβος of Theophrastus and Dioscorides, from ορω
excito, and βους, bos, being used by the ancients
for fattening oxen.

Not immediately connected with our present inquiry, as food for cattle—found on most of our mountains, and in many of our woods—roots large, tuberous, and sweet.—Highlanders chew them, to give a better relish to their liquor—other qualities attributed to them.

ARTIFICIAL

ARTIFICIAL GRASSES, including VETCHES, being fully considered, other vegetables of a miscellaneous nature merit the particular attention of the farmer—but previous to their consideration, perhaps it may be necessary to impress on the minds of those engaged in rural affairs, how necessary it is, that the farmer's attention should be assiduously directed, and encouragement held out to him, to encourage the growth of plants, of the leguminous description, which have been already noticed, as they are not only very productive in respect to quality of food, but, from every source of information, highly nutritious and fattening; and, besides, all our live-stock most anxiously and eagerly feed upon them. Some may appear to be rather of a coarse nature, but we are not hastily to conclude, that they are of no use, and condemn them, but that, under certain circumstances, and judicious management, they may turn out to be very valuable.

Achillea Millefolium,

Yarrow.

Irish name, ATHAIRTHALMHUIN COITCHION.

Fl. Lond. v. 2. t. 373. Fl. Rust. t. 123. Eng.
Bot. v. 11. t. 758. Cat. Syst. Dub. 237.

Very common—forms the principal herbage of many fine rich pastures—appears to be much relished

lished by cattle and sheep—predominant on all our descriptions of soils—resists the effects of drought—merits much attention in many points of view—may be of service to cattle medicinally?—scab in sheep, cured by an ointment made with the fresh leaves—in Sweden used in the place of hops.—Mr. Anderson speaks highly of yarrow—his observations.

Mr. Tighe, the able Reporter of the county of Kilkenny, tells us, that sheep appear to be very fond of yarrow, and which they never suffer to flower; he observes, that a field, remarkable for fattening sheep, had a large quantity of it, which grew with remarkable luxuriance near a lime-kiln.

Planta'go lanceola'ta,

Rib-grass.

Irish name, CRUACHPHADRUIC SLANLUS.

Fl. Lond. v. 1. t. 85. Fl. Rust. t. 67. Eng. Bot. v. 8. t. 507. Cat. Syst. Dub. 38.

No plant more common—a great diversity of opinion as to its agricultural merits—Mr. Young and Mr. Anderson think well of it—Mr. Curtis, a favourite food for sheep—his further remarks on it. Professor Martyn, no high opinion of it—its non-appearance in marshy lands, an unerring indication of their poverty.—Mr. Dickinson and
Doctor

Doctor Withering's opinion of rib-grass—from the latest and highest authorities, highly relished by neat-cattle and horses.—Lands most proper for its successful cultivation—Mr. Marshal, Rural Economy of Yorkshire, in much esteem for sheep-feed—improper for hay—reasons assigned.

The plantago tenuifolia, grass-leaved plantain, recommended by some very late agricultural writers—undoubtedly plantago maritima,* sea-plantain—proves the necessity of botanical knowledge to the agriculturist—properties attributed to sea-plantain—amongst others, cattle, sheep, and horses eat it with greediness, particularly sheep, who pare it as close as possible.

Pote'rium Sanguisor'ba,

Common burnet.

Irish name, NAMHNEIGH FIADHAIN.

Fl. Lond. v. 1. t. 88. Fl. Rust. t. 69. Eng.

Bot. v. 12. t. 860. Cat. Syst. Dub. 257.

Ποτηγιον of Dioscorides. From ποτηριον, a cup.

Common on high mountainous calcareous soils—leaves smell, and taste like cucumber—principal use, for sheep-pasture—succeeds on many of our grounds—as food for sheep in certain parts of England, forms almost the whole of the herbage
over

* Eng. Bot. t. 175. Cat. Syst. Dub. 24.

over a great extent—a very early bite for sheep and cattle—sometimes in the latter end of January—to be used in its more tender and young state of growth—has afforded three cuttings in the season—affected less by severe winter weather, than most other herbaceous plants—resists the effects of drought in a remarkable degree—affords a large produce in hay—cautions necessary with this intention—horses sometimes fed with the seeds and chaffy materials—best means of being supplied with good feed—on grounds intended for sheep-pastures, should be sown broad-cast.—Cows prefer burnet to clover—causes of its failure sometimes in cultivation.

Sanguisorba officinalis,* great burnet—by a common observer, might be taken for our common burnet—is coarse, and not at all acceptable to cattle—not to be met with in a wild state in Ireland?

Cichorium In'tybus,

Chicory.

Irish name, ENDIVIA SIUCHAIR.

Fl. Rust. t. 144. Fl. Lond. v. 1. t. 144. Eng. Bot. v. 8. t. 539. Cat. Syst. Dub. 218.

Introduced into England in 1788, as food for cattle—in many of the volumes of Annals of Agriculture,

* Fl. Rust. t. 142. Eng. Bot. v. 19. t. 1312.

Agriculture, recommended as an object of high importance in agriculture, for the summer feeding of cattle, horses, and sheep—very large and succulent under cultivation—resists the heaviest rains, and severest blasts—defies drought, and the most sharp cold—allows of from two to four cuttings in the year, according to circumstances—cut for soiling as wanted—affords a fresh supply of food for seven or eight months—roots dried, and powdered, have been made into bread.

Soils, on which it best succeeds—preparation of the soil—less particular than many other similar plants as to soil.

Like most other seeds used in agriculture, liable to be mixed in the feed-shops—should be sowed by the cultivator himself—when new, vegetate in a most perfect and quick manner.—Quantity to be sown per acre—according to the nature of the land, intentions of the farmer, &c.—usual proportion, from ten to twelve pounds—in the row method, from seven to eight pounds—a full portion should be always sown, chicory not being of the tillering or spreading kind.

Periods of sowing—must depend upon the particular views of the cultivator—*without* other crops from the middle of March till the latter end of summer—*with* other crops—must depend upon the season, when such are sown—generally sown broad-cast—considered likewise as well adapted to the

the row-method of cultivation—reasons assigned for both practices.

Averaged produce of chicory for four years, cut green, according to Mr. Young—thirty tons an acre!

Comparative experiments of stall-feeding eight bullocks with chicory and vetches, Ann. of Agriculture, vol. 20th—its utility as pasturage by other statements, Ann. of Agriculture, vol. 15th.—Further observations and experiments on this highly valuable herbaecous succulent perennial, Ann. of Agriculture, vol. 28th.

Polyg'onum Fagopy'rum,

Buck-wheat knot-grafs.

Irish name, GLUNEAGH ROMHAN.

Fl. Rust. t. 46. Eng. Bot. v. 15. t. 1044.

Πολυγονον of Dioscorides. From πολυ and γονυ, on account of many knots in the stalks.

Should buck-wheat be considered as indigenous either in England or Ireland, though it is now and then to be met with about cultivated grounds?

In many parts of the Continent a very common crop—with us scarcely known as a crop.—Seeds afford

afford a nutritious meal—further particulars as to its value in this last point of view.

A diversity of opinion as to the value of buck-wheat in England—grows on most kinds of soils, provided they be dry, especially those of a sandy nature.

Preparation of the land for the reception of the seed—proportions of the seed to be sown—fit times for sowing—methods—generally broad-cast, well harrowed in.

Application of the crop—for seed, used as green fodder, or ploughed in as manure.

Produce of seed—which is used in England for feeding horses, fattening hogs, and keeping poultry—increases the flow of milk in milch-cows very considerably—effects on hogs.

Directions for ploughing it in for the purpose of manure—scientific, new, and interesting—applicable to many other succulent green vegetables, treated with the same intention.

Buck-wheat, an excellent crop for sowing grass-seeds with—with vetches, a most excellent preparation for wheat.

Mr. Young's sentiments on the combination of crops.

In harvesting buck-wheat, care should be taken that it do not shed.

CONCLUSION.

CONCLUSION.

A FEW general observations on our common soils, so far as regards the most approved methods of disposing of artificial grasses, conjoined with our common meadow and pasture grasses on such soils.

Meadow and pasture grasses very fully considered upon a former occasion—herbaceous plants, which have engaged our attention lately, may be arranged and found useful in respect to soils, somewhat in the manner now to be described—the information taken from the best, the most authentic, and recent authorities.

SOILS.

CLAYEY SOILS.

Perennial clover or cow-grass—trefoil—united with certain of the meadow and pasture grasses—such enumerated and exhibited.

LOAMY

LOAMY SOILS.

White clover—yarrow—lucern—united with certain of the meadow and pasture-grasses—such enumerated and exhibited.

SANDY SOILS.

White clover—yarrow—burnet—trefoil—rib-grafs—with certain of the meadow and pasture-grasses—such enumerated and exhibited.

COMPLETE CALCAREOUS SOILS.

Yarrow—faint-foin—burnet—trefoil—white clover.

BOGGY AND TURFY SOILS.

White clover—rib-grafs—united with certain of the meadow and pasture-grasses—such enumerated and described.

Variations of soil—preparation of the lands, and some other circumstances may alter this general arrangement.

EARLY

EARLY HERBAGE,

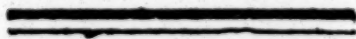
May be looked up to in the following routine,
and stand in this order :

Meadow and Pasture Grasses.

Sweet-scented vernal — meadow fox-tail —
smooth-stalked meadow — rough-stalked meadow —
tall oat — rough cock's foot — hard fescue.

Artificial, or Sown Grasses.

Burnet — rib-grass — ray-grass — trefoil — red
clover.



Are grasses, or other plants, which abound in
sweet jointed succulent stems, and abundant
foliage, the most nutritious? — convincing reason-
ings, and satisfactory facts to prove they are.

PROPORTIONS

PROPORTIONS OF SEEDS TO BE SOWN ON THE DIFFERENT SOILS.

Preliminaries to be observed and attended to—old tillage land, in general, requires a much larger proportion of seed, than those more recently broken up—cold exposed situations require a greater quantity of seed than those, that are low and warm—lands designed for pasture, a larger proportion than when hay is the principal object.

CLAYEY SOILS.

Perennial clover, or cow-grass, five pounds—trefoil, five pounds—crested-dog's-tail, ten pounds—meadow-fescue, one bushel—meadow-fox-tail, one bushel—on the heavy sorts of land, that are to be broken up in a year or two, from ten to fourteen pounds red clover—when to remain permanent—perennial clover, or cow-grass, from four to six pounds—white clover, four pounds.

LOAMY SOILS.

White clover, five pounds—crested dog's-tail, ten pounds—ray-grass, one peck—meadow-fescue, three pecks—meadow-fox-tail, three pecks—
D
yarrow,

yarrow, two pecks—further observations to be attended to.

SANDY SOILS.

White clover, seven pounds—trefoil, five pounds—burnet, six pounds—ray-grass, one peck—yarrow, one peck—rib-grass, four pounds—many experienced farmers in England advise only five pounds of white clover and trefoil, with a bushel of ray-grass, and about an equal quantity of collected grass-seeds.

CALCAREOUS SOILS.

Burnet, ten pounds—trefoil, five pounds—white clover, five pounds—yarrow, or ray-grass, one bushel—saint-foin much recommended—other circumstances to be attended to.

TURFY, OR BOGGY SOILS.

White clover, ten pounds—crested dog's-tail, ten pounds—ray-grass, one peck—meadow-fox-tail, two pecks—meadow-fescue, two pecks—cat's-tail, one peck.

Of

Of much importance, that a full proportion of seed should be sown in every instance, where the land is designed for pasturage.

In the "*Sketch of Lectures on Meadow and Pasture Grasses*," and in the present "*Sketch*," the proportions of grass-seeds recommended per acre for laying down land for the purpose of good meadows, and the several species, whether natural or artificial, either for a convertible system of corn and grass, or for lands that are to be kept in a permanent state of sheep-pasture, were enumerated and enlarged upon.—A recapitulation of such—some necessary observations and useful remarks—a general comment on the whole.





QUERCUS,

OR

OAKS:

FROM THE FRENCH

OF

MICHAUX,

HISTOIRE DES CHÊNES

DE L'AMERIQUE SEPTENTRIONALE,

WITH NOTES

AND

AN APPENDIX.

BY

WALTER WADE, ESQ. M. L. S.

OF THE KING AND QUEEN'S COLLEGE OF PHYSICIANS
IN IRELAND, &c. &c. &c.

—Δρυος ἔλυμα πρηνεδε γυνη. *Hesiod, E. 436.*

DUBLIN:

Graisberry and Campbell,

PRINTERS TO THE RIGHT HON. THE DUBLIN SOCIETY.

1810.

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PREFACE.

I AM induced to lay before the Society an account of the North American oaks, from the French of “*Michaux’s Histoire Des Chênes De L’Amerique Septentrionale,*” as I believe no full view or translation of this highly useful, valuable and elegant work, has yet appeared in English dress.

The very enlarged and interesting edition of Miller’s Dictionary, by Professor Martyn, lately published, takes no notice whatsoever of the N. American oaks, as arranged by Michaux and Willdenow, which circumstance appears to me somewhat extraordinary, as the former published his *Histoire Des Chênes*, in 1801;

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and

and the latter that part of his *Species Plantarum*, which treats of oaks, in 1805; whereas the part, which speaks of *Quercus* or Oaks, in Professor Martyn's *Miller* was published in 1807. By those observations I mean no slight whatsoever, nor would wish to be considered as insinuating any want of attention or industry on the part of the highly learned and respectable author, who perhaps has not seen the publications alluded to, or whose observations on oaks perhaps were printed off, before they fell into his hands; but merely to account and apologize for my presuming to take up a subject so interesting, and laying this translation before the Society.—Moreover, as professor and lecturer on botany to this valuable and useful body of noblemen and gentlemen, originally instituted for the purpose of encouraging agriculture, husbandry, and planting, I consider myself called upon, from motives of very high consideration, to miss no opportunity of
of

of submitting to them, and through them (as has ever been the case) to the public, the earliest notice of every interesting fact, particularly such as has not appeared elsewhere, within the immediate views of the Society's grand establishment, and my particular province.

To this translation from the French of the elder Michaux, I have added most of the observations of his son in his "*Travels to the Westward of the Allegany mountains*," on the same subject, a subsequent work.

The remarks of Catesby, in his "*History of Carolina, &c.*" and others on American oaks, I have but slightly touched upon.

Willdenow's *Species Plantarum*, published at Berlin, a work I presume in the hands of but few, at least so far, as *Quercus* or Oaks reach, a publication of the very first rate authority, as to classic and systematic arrangement, besides afford-

ing a very comprehensive view of all the discoveries of the various celebrated modern authors, who have travelled in search of vegetable treasures to the remotest parts of the globe; I have so far abstracted from, as, I conceive, must satisfy the scientific botanical enquirer into the economy of the oak.

In an appendix I have noticed some other oaks, besides those which are to be met with in North America; to this I am led by their growing, and at present to be seen in the Society's Botanical garden at Glasnevin, interspersed with a great majority of the American oaks mentioned in this translation.

This trifling attempt must be considered as preliminary and introductory to a more enlarged work on oaks, particularly on such as are to be seen in the different plantations in this kingdom; of course I have reserved my sentiments at large on this subject, and the information

mation I have collected from the highest published authorities of the day, with a sincere hope that the noblemen and gentlemen of Ireland will furnish me with such interesting and faithful documents, as may enable me to lay before the public a full and true report of the different species, and varieties of oaks growing in Ireland; the soils on which they best succeed—the true mode of cultivating them—their age, height, and girth—whether raised from the acorn or otherwise—whether such as are called deciduous ever become evergreens, or, in other words, whether they occasionally assume the evergreen state—when they first produced fruit or acorns—if possible, the proportion of stamiferous or male flowers to the pistilliferous or female flowers—at what season of the year both were produced, and the fruit perfected—the number of stamina or male parts in each flower, would be interesting to ascertain

certain, and the number of acorns on each peduncle or fruit stalk, with their size, shape, and every thing remarkable attending them.

It is highly probable no great number of *species* of oaks have yet been cultivated in this kingdom, but my object is to ascertain the fact. The common oaks, as the *quercus robur*, or most common, the *quercus Ilex*, or evergreen oak, the *quercus gramuntia*, or holly-leaved oak, the *quercus Prinus*, chestnut-leaved oak, the *quercus Cerris*, Turkey oak, and a very few others, adorn many of our woods and plantations; but the cultivation of American oaks, and some others, which would endure our climate exceedingly well, is, I believe, but still in its infancy.

I have fully described the titles of the authors, to which I have referred, in order to induce the attention of those, who wish to enter assiduously into the subject. It may be asked, why I refer to a work on
insects?

insects? Because it gives beautiful and satisfactory coloured figures of the species of oak, on which the little creatures feed. I have, throughout, paid attention to plates, both coloured and plain, in the respective works within my research, many of which may be consulted in the Society's library; as I conceive good representations of the objects, as to their forms and appearances in their various stages of growth, must convey much more satisfactory information in this point of view, than any description whatsoever.

A list of the species of oaks growing in various parts of the globe, and known at the present day, I consider as interesting information; I have, therefore, subjoined the number of species, taken from, and arranged according to Willdenow, in the fourth volume of his *Species Plant.* p. 423, &c. together with their habitats, or native places of growth.

The

The second edition of Duhamel's *Traité des Arbres et Arbustes*, with very considerable interesting additions, improvements, and highly finished and exact botanical representations of above two thousand species of trees and shrubs in their natural colours, by that admirable artist, M. Redouté remains still to be consulted on the subject of oaks, as only a few numbers have reached the Society's library, the oaks not included ; but from the specimen before us of this admirable work, much is to be expected on *Quercus*, or Oaks.

Dublin, December, 1808.

AUTHORS

AUTHORS REFERRED TO.

ABBOT'S INSECTS.

ABBOT's History of the rarer Lepidopterous Insects of Georgia, by Smith; French and English; including their systematic characters, the particulars of their several metamorphoses, and the *plants* on which they feed, with many plates beautifully coloured from nature. 2 vols. Lond. 1767.

AITON, HORT. KEW.

Hortus Kewensis, or a Catalogue of the Plants cultivated in the Royal Botanic garden at Kew, by William Aiton, gardener to His Majesty. London, 1780. 3 vols. octavo.

BARTRAM, TRAV.

Travels through North America, Georgia, East and West Florida, the Cherokee country, the extensive territories of the Muscogulges or Greek Confederacy, and the country of the Chactaws. By William Bartram.

BAUHIN. HIST.

Johannis Bauhini Historia Plantarum, Ebrod. 1650, et 1651. fol. 3 tom. cum figuris ligno incisis.

BLACKWELL.

BLACKWELL.

Herbarium Blackwellianum emendatum et auctum, cum Præfat. D. Chr. J. Trew, Cent. i.—vi. Noremberg. 1750, 1772. fol.

CATESBY, CAROLIN.

The Natural History of Carolina, Florida, and the Bahama Islands, by Mark Catesby. London, 1731, 1743. fol. 2 vols. Eng. and French, 100 plates in each volume, besides 20 in the Appendix, coloured.

CLUS. HIST.

Clusii Historia Plantarum. Antverpiæ, 1601. fol. wooden cuts.

DESPONT. ATLANT.

Renati Desfontaines Flora Atlantica, seu Historia Plantarum, quæ in Atlante, agro Tunetano et Algeriensi crescunt. Paris quarto, plates 261.

DOD. PEMP.

Remberti Dodonæi, s. Dodoens-Stirpium Historiæ Pemptades sex, s. libri xxx. 1616. fol. cum figuris ligno incisis.

DUHAM. DU M.

Traité des Arbres et Arbustes, qui se cultivent en France, en pleine terre, par M. Duhamel du Monceau, tomes 2. Paris. 1755. quarto.

DU ROI HARB.

J. Phil. du Roi Harbkesche Wilde Baumzucht, s. Band heraus-gegeben mit Vermehrungen und Veranderungen von J. F. Pott. Braunschweig, 1795. or, Method of rearing wild Trees, by J. Philip Du Roi; first volume published with additions

ditions and improvements, by J. F. Pott, Brunswick, 1795, in octavo.

ENG. BOT.

English Botany, or coloured Figures of British Plants, &c. by James Edward Smyth, M. D. F. R. S. &c. &c. &c. the Figures by James Sowerby, F. L. S. London, 1790, &c.

EVEL. SYLV.

Sylva, or a Discourse of Fruit Trees, with Terra, Pomona, Acetaria, and Kalendarium Hortense, by John Evelyn, Esq. with Notes by Doctor Alexander Hunter, &c. 59 plates. York Edition.

FL. DANIC.

Icones Plantarum sponte nascentium in Regnis Daniæ et Norwegiæ, editæ a Geo. Ch. Oeder, Oth. Frid. Muller, et M. Vahl. Hafniæ, 1761, &c. fol.

FL. RUST. MART.

Flora Rustica, exhibiting accurate figures of such plants as are useful or injurious in husbandry. By Thomas Martyn, B. D. F. R. S. &c. 4 vols. 8vo. London, 1792, &c.—with 144 coloured figures by Nodder.

FUCHS. HIST.

Leonardi Fuchsii de Historiâ Stirpium Commentarii. Basil. 1542. fol. with large wooden cuts, admirably done for the time.

GARIDEL. AIX.

Histoire des Plantes qui naissent en Provence, et principalement aux environs d'Aix. Par M. Garidel. 1719. fol. Paris, with plates.

Haller.

HALLER. HELVET.

Alberti Von Haller Historia Stirpium indigenarum Helvetiæ inchoata. Bern. 1768. fol. tom. 3. tab. Æn. 48.

LOBEL. MATT.

Lobellii Icones Plantarum. Antwerpiae. 1591. 4o.

RENAULT. BOT.

La Botanique mise à la porte de tout le monde, ou collection des Plantes d'usage dans la Medecine, dans les aliments, et dans les Arts. Paris, 1774. fol.—467 coloured plates.

RUSSEL. ALEP.

The Natural History of Aleppo, and parts adjacent, by Alexander Russel, M. D. F. R. S. Lond. 1794, 4to. revised, enlarged, and illustrated by Pat. Russel, his brother.

SECONDAT. DU CHENE. Memoires sur l'Histoire Naturelle du Chene. Par M. de Secondat. Paris. 1785, fol.

SMITH. FL. BRIT.

Flora Britannica auctore Jacobo Edwardo Smith, M. D. &c. &c. &c.—Londini, 1800, &c.

TABERNÆMONT.

Jac. Theod. Tabernæmontani Kräuterbuch. Basil. 1664. fol. cum figuris ligno incisis.

WANGENH. AMER.

Beytrag zur teutschen holzgerechten Forstwissenschaft, die anpflanzung Nordamerickanischen Holzarten mit anwendung auf Teutsche forste betreffend von Fried. Adam Julius von Wangenheim. Gotting. 1787. fol. tab. 31. or a Treatise

tise on the knowledge of the jurisdiction of German forests, the Planting of North American trees in Germany. By Fred. Adam Julius Wangenheim.

WILLDENOW. ARB. Berlinische Baumzucht. Berlin. 1796. or The rearing of trees according to the methods practised in Berlin.

WILLDENOW. SP. PL. C. a Linné Species Plantarum. Editio quarta, post Reichardianam quinta, adjectis vegetabilibus hucusque cognitis, curante Carolo Ludovico Willdenow. Berolini, 1797, &c. 8vo.

WOODV. MED. BOT. Medical Botany, containing systematic and general descriptions, with coloured plates of all the medical plants, indigenous and exotic. By William Woodville, M. D. London, 1806, &c. 4 vol. 4o. second edition.

INTRODUCTION.

IT is of very little consequence to estimate the utility of the oak according to ancient records, or whether mankind in the early ages lived upon the Acorn. It is very probable that the word, *Acorn*, was formerly a generic name, applied to different fruits. The Arabs called the date-tree *Tamar*, and to this they added a specific name, when they wished to distinguish it from other fruits; thus the Tamarin or Tamarind was called *Tamar Hendi*, the date of India, &c.

The Greeks made use of the word *Βαλανος* (Balanos) to signify the date, the chesnut, the acorn, and many other fruits, and the people employed in gathering such
fruits

fruits were called *Βαλανισται* (Balanistes). The Latins also used the word *Glans* as a generic name; the date was called *Glans Phœnicia*, the chesnut *Glans Sardiana*, the fruit of the walnut, *Jovis glans* or *Juglans*, &c.

’ In short, the Gauls called the fruit of many trees indiscriminately acorns, as the acorn of the oak, the beech, the walnut, &c. It is therefore to be presumed, that under the generic term acorn, dates, chesnuts, &c. have been formerly, as well as at the present day, preferred to the fruit of the oak, as the food of many nations.

Plutarch calls the Arcadians *Βαλανη-φαγοι* (Balanephages) and observes that they were considered as invincible, because their principle food consisted of acorns. Without recurring to ancient history, I will admit that it is very probable, acorns might be eatable. It is certain that throughout the Morea and Asia Minor, a sort of acorn, fit to be eaten, is sold in
their

their markets at the present day. Olivier, who some time since visited these countries, has ascertained the fact. Michaux says, that at Bagdad he eat the best acorns, that grew in Mesopotamia and Curdistan; they are as thick and as long as a man's finger; he also tasted of those which are eaten in Spain, and they appeared to be rather sweet. Desfontaines makes mention, in the Memoires of the Academy of Sciences, of the acorns of the *Quercus ballota* being good for eating. Michaux's object at present is to speak of the value of the oak as universally employed, and to make known the different species, which he observed in North America.

The oak grows naturally in every part of the temperate zone, in Europe, Asia, America, and even in Africa—its cultivation requires particular attention, transplanting, engrafting, and other means of reproduction, not being always favourable. Nature has particularly fitted the oak for

b

large

large forests ; it there towers with imperial dignity over every other vegetable, and supplies animals of different kinds with abundant food. In Europe, the stag, the roebuck, and the wild boar live during the winter entirely on the acorns, which they meet with in the woods—in Asia, pheasants and many of the feathered tribe, share them with the fawns—in North America, the bear, the squirrel, the pigeon, the wild turkey, &c. seek with much industry for the acorn, and it has been observed that many species of animals of the continent of America, after having consumed the acorns of one territory, migrated in innumerable flocks into other countries, where the acorns were to be met with in greater abundance.

The oak, of all other trees, is that whose timber is employed the most, generally and usefully—it serves for building ships, houses, instruments for the various purposes of agriculture, &c.—it affords substances

stances used in medicine, its bark is almost indispensably necessary for the tanner, the dyer, &c. in short, it is the daily food for fuel so necessary to our existence.

There are many species of oak entirely unknown, and the majority of such as grow in America assume such a variety of forms in their young state, that they cannot be distinguished with certainty, but in proportion as the tree arrives at maturity. It seems as if nature wished to multiply the oak, and to render it of general advantage in causing different species to grow under the same latitudes, and accommodate themselves to the various degrees of temperature and soil—for the oak does not always grow in forests, neither does it invariably arrive to a great height;—there are countries which produce only dwarf oaks, as the Kermes oak, or *Quercus coccifera* of *Linnæus*, and some others, which are by their nature small; whilst others again, which grow on rocks, and
the

the coasts of the Mediterranean sea, are generally stunted and of diminutive stature, occasioned only by the aridity of the soil, in which they have originally lodged themselves. Many varieties also exist, merely occasioned by accidental causes.—In N. America, dwarf stoloniferous or creeping oaks occur, whose multiplied shoots cover immense tracts of land.—The meadows situated in the midst of the forests of America are burned annually by the savages, and new inhabitants, who endeavour by this custom to produce a new herbage, with the view of attracting the fawns, and feeding cattle thereon—the forests themselves having caught fire in their turn, and the tall trees being destroyed, the horizontal roots of many species of oak, detached from the trunk, reproduce of themselves, and separately, shoots, which yield fruit afterwards at the height of two or three feet—each bundle or assemblage of these shoots on
the

the same stock may be considered as a dwarf tree, or without a stem; for the fire, by consuming the trees down to the root, produces the same effect, which amputation of the stalk would do, or as lopping on the cultivated pear or other fruit trees, which otherwise would become tall trees, but by repeated operations of pruning remain dwarfs, and produce fruit bearing branches immediately near the root. Many travellers, from want of leisure to investigate these oaks with due attention, have considered them as a particular species, but those whose acorns were sown shot forth, as well as the others, a descending small root without producing shoots;—it is therefore highly improbable, that there are oaks naturally stoloniferous or creeping.

At the present day there are numerous varieties of the oak, and to determine the species, to which they ought to be referred, is attended with much difficulty—an intermediate

intermediate variety, in fact, seems to resemble two species so much, that it is frequently no easy matter, by the examination of the leaves, to determine to which of the two species this variety ought to be referred. Some species, liable to vary when young, are at this period so different, that the characters of the leaves are insufficient to determine the same species in the young oak, and the full grown one: many others, on the contrary, exhibit such an uniformity of character, that the specific distinctions can only be established on the fructification, which is itself subject to variations, and therefore exceptionable. It is by comparative observations only, on oaks in their full grown state, and when they are young, that we can succeed in distinguishing the species, which have so great an affinity to one another, and to refer the varieties to their species.

The oaks of North America have hitherto been but obscurely described, owing to
many

many reasons. In the first place, botanists, who have visited North America, give but loose and hasty observations on these trees, and besides have paid no attention whatsoever to the fructification—and secondly, by this slovenly mode of proceeding, authors have too frequently confounded many species under one and the same denomination. In short, the plates which have appeared, of the American oaks cultivated in Europe, are by no means exact, because their growth in Europe is retarded by the climate, which is less favourable to them than that of their native country; and besides, they there preserve for a longer time the varieties of their foliage, which characterize them in their young state of growth. *

Michaux, in order to satisfy himself, and clear up his doubts, sowed and cultivated,

* Many of the figures of Du Roi, and Plucknet, pl. liv. fig. 5. represent oaks, which had not acquired their full grown state.

vated, during his residence in North America, all the species he observed and collected; and on the second year, he had the satisfaction to discover all the varieties, which had occasioned him so many uncertainties, when he wandered over the forests. By paying much attention to the changes which certain species assumed, until they arrived to their full growth, he discovered, in the very young trees, the characteristic marks of their species; and it was thus that Michaux obtained a knowledge of the relations which arise amongst them. In order to assimilate them, he profited by the means, which nature herself seemed to furnish him with: but if, on one side, the follower of nature succeeds, by the assimilation of their species, to connect them together, on the other hand, he finds himself much puzzled when it is requisite to determine each species, and to assign peculiar and distinctive characters.

Michaux

Michaux endeavoured to arrange the different species of North American oaks in a natural order; and with this intention, he first supposed that the parts of fructification would supply him with characters, sufficient to establish this natural order; but none of them afforded him the means; and he discovered only distinctions of very little importance, such as their attachments being sometimes nearly sessile, sometimes pedunculated; the size of the acorn and its cup, the different periods of maturity, &c. Neither was it in his power to establish a sufficient distinction on the structure of the cup of the acorn. He then made his observations on the leaves, and they seemed to afford him more striking characteristics, and Michaux has therefore used them, in order to establish two sections of oaks. The first section contains such species as have awnless leaves, or, in other words, which have no bristly points: the second, those with

with leaves, whose points or indentations are terminated by a bristle or awn.

The interval of time which elapses, from the appearance of the flower, and the ripening of the fruit, is not the same in every species of oak. This circumstance, which Michaux at first considered as insufficient to establish the two principal sections, has nevertheless appeared to him, to be of sufficient importance, to admit it as a secondary character.

It is well known, that every species of oak is monoicous, and that in the *Quercus Robur*, or common oak, and in many other species, the male flowers are situated on the young branches which grow in the spring, and that the female flowers are disposed on the same branches, above the male flowers. It is also known that both are axillary, and that, immediately after the impregnation of the pistilliferous, or female flowers, the stameniferous, or male flowers wither and fall, whilst

whilst the females continue to grow, and arrive, in the course of the same year, to a perfect state of maturity, by ripening their fruit. This is the usual course; however, it is not the case with many species of oaks, in which the female flowers are seen to appear in the spring, and remain an entire year without perfecting their fruit. It is to be presumed that they are not fertilized the first year, since it is only after the second spring they increase in bulk, and arrive at maturity. Here then is an interval of eighteen months, from the appearance of the flower until the perfection of the fruit. These considerations then have afforded Michaux two secondary divisions—the one comprehending the species which he calls the *annual fructification*, that is to say, for which the usual space of six months is sufficient for the perfection of the fruit—the other contains the species whose fructification is *biennial*, that is to say, whose fruit does
not

not ripen, until the expiration of eighteen months. It must be remarked that, when the fructification is annual, it remains always axillary, whilst in the biennial species it is not so, but only the first year: but on the second year, and when the leaves fall, it is necessarily found isolated or standing by itself. CLUSIUS has made this remark respecting the *Quercus cerris* of Linnæus, whose fructification is biennial; he expresses himself thus: “*Flores racematim compactos, ut quercus, è quibus uti nec in quercu nascuntur caliculi, sed ii brevi crassoque pediculo, annotinis ramulis adhærent, non in foliorum alis, omnino hispido,*” &c. CLUS. *Hist. Pl. Rar.* pag. 20.

Those whose fructification, though biennial, and remaining always axillary, must be excepted, because the leaves do not fall, such as the *Quercus coccifera* of Linnæus, and the *Quercus virens* of Aiton. Michaux also observes, that in the ancient continent oaks of a biennial fructification

are

are to be found, as the *Quercus cerris*,
Quercus Ægilops, *Quercus coccifera*, of Lin-
næus; *Quercus pseudosuber* of Desfon-
taines, &c.



AMERICAN OAKS.



QUERCUM AMERICANARUM.

DISPOSITIO METHODICA. *

FOLIIS
ADULTÆ PLANTÆ
MUTICIS.
Fructus pedunculati.
Fructificatio annua.
(in specie 6^a biennis.)

FOLIIS
ADULTÆ PLANTÆ
SETACEO-MUCRONATIS.
Fructus subsessiles.
Fructificatio biennis.

lobatis.....	1. QUERCUS obtusiloba.
	2. Q. — Macrocarpa,
	3. Q. — lyrata.
	4. Q. — alba: <i>pinnatifida.</i>
	— — — <i>repanda.</i>
dentatis	5. Q. Prinus: <i>palustris.</i>
	— — — <i>monticola.</i>
	— — — <i>acuminata.</i>
	— — — <i>pumila.</i>
integris	6. Q. virens.
	7. Q. Phellos; <i>sylvatica.</i>
	— — — <i>maritima.</i>
	— — — <i>pumila.</i>
integris.....	8. Q. cinerea.
	9. Q. imbricaria.
	10. Q. laurifolia.
	Q. — — — <i>obtusifolia.</i>
breviter lobatis.	11. Q. aquatica.
	12. Q. nigra.
	13. Q. tinctoria: <i>angulosa.</i>
	— — — <i>sinuosa.</i>
	14. — triloba.
	15. Q. Banisteri.
	16. Q. falcata.
	17. Q. Catesbæi.
profunde multifidis.	18. Q. coccinea.
	19. Q. palustris.
	20. Q. rubra.

* WILLDENOW Sp. Plant. vol. 4. p. 423, &c. enumerates 76 species of oak—the arrangement differs more or less from that of MICHAUX's; as follows, noticing here only the North American species as observed and mentioned by Michaux.

† *foliis integerrimis*, with leaves very entire.

1. Quercus Phellos.	Willd.	Quercus Phellos; <i>sylvatica.</i>	Michaux.
2. ——— <i>maritima</i>	——	—— ——— <i>maritima,</i>	——
3. ——— <i>sericea</i>	——	—— ——— <i>pumila,</i>	——
5. ——— <i>virens</i>	——	—— <i>virens,</i>	——
6. ——— <i>cinerea</i>	——	—— <i>cinerea,</i>	——
12. ——— <i>laurifolia</i>	——	including the two varieties of Michaux.	
13. ——— <i>imbricaria</i>	——	Quercus imbricaria,	——

†† *foliis dentatis*; with leaves toothed.

40. Q. Prinus,	Willd.	Q. prinus; <i>palustris,</i>	Michaux.
41. — Prinoides,	——	—— ——— <i>pumila,</i>	——
42. — <i>montana,</i>	——	—— ——— <i>monticola,</i>	——
43. — <i>bicolor,</i>	——	—— ——— <i>tomentosa,</i>	——
44. — <i>castanea,</i>	——	—— ——— <i>acuminata.</i>	——

††† *foliis apice lobatis*; with leaves lobed at their extremities.

45. Q. aquatica,	Willd.	Q. aquatica,	Michaux.
46. — <i>nigra,</i>	——	—— <i>nigra,</i>	——
47. — <i>triloba,</i>	——	—— <i>triloba,</i>	——

†††† *foliis sinuatis lobis mucronatis*; leaves sinuated, lobes bristled.

49. — <i>hemisphærica,</i>	Willd.	Q. aquatica <i>varietas,</i>	Michaux.
50. — <i>elongata,</i>	——	—— <i>falcata (exclusis synonymis)</i>	——

METHODICAL ARRANGEMENT OF AMERICAN OAKS.

LEAVES
in
THE FULL GROWN TREE,
without
aristæ, beards or awns, or
bristles.
Fruit pedunculated.
Fructification annual,
(except sixth species,
which is biennial)

lobed or the
margins of
the segments
rounded.

toothed, be-
set with pro-
jecting hori-
zontal rather
distant teeth
of its own
substance.

entire.

entire.

LEAVES
in
THE FULL GROWN TREE
with
bristly points.
Fruit almost sessile or
not quite destitute of a
peduncle, or fruit stalk.
Fructification biennial.

slightly
lobed,

deeply slit,
cut, or jag-
ed.

- * 1. q. obtusifolia, upland white oak, iron oak.
- 2. q. macrocarpa, over cup white oak.
- * 3. q. lyrata, water white oak.
- * 4. q. alba: pinnatifida, white oak.
- repanda, sinuated white oak.

- * q. prinus: palustris, swamps chesnut oak
- monticola; mountain chesnut oak; rocky oak.
- acuminata, narrow live chesnut oak.
- pumila, Chinquapin oak.
- tomentosa, downy chesnut oak.

- * 6. q. virens, live oak.
- * 7. q. phellos, sylvatica willow oak
- * q. ————maritima, sea willow oak.
- pumila, dwarf willow oak
- 8. cinerea, upland willow oak.
- 9. imbricaria, shingles willow oak
- 10. q. laurifolia, swamp's willow oak.
- obtusloba.

- * 11. aquatica, water oak.
- * 12. q. nigra, black oak.
- * 13. q. tinctoria; angulosa, great black oak, Champlain black oak, Quercitron oak.
- sinuosa, sinuated Quercitron oak.
- * 14. q. triloba, downy black oak.
- * 15. q. Banisteri, running downy or Banisters oak.
- * 16. q. falcata, downy red oak.
- 17. q. Catesbæi, sandy red or Catesby's oak.
- * 18. q. coccinea, scarlet oak.
- * 19. q. palustris, swamp's red oak.
- * 20. rubra, red oak.

51. — tinctoria,	————	— tinctoria; angulosa,	————
52. — discolor,	————	— ———— sinuosa,	————
53. — rubra,	————	— rubra,	————
54. — coccinea,	————	— coccinea,	————
55. — Catesbæi,	————	— Catesbæi,	————
56. — palustris,	————	— palustris	————
59. — ilicifolia,	————	— Banisteri,	————
++++ foliis sinuatis, lobis muticis; leaves sinuated, lobes without bristles.			
62. Q. alba,	Willd.	Q. alba,	Michaux.
71. — stellata,	————	— obtusiloba,	————
72. — lyrata,	————	— lyrata,	————
73. — macrocarpa,	————	— macrocarpa,	————

Numbers 1, 2, 3, &c. refer to the individual species in WILLDENOW.

* In the Botanical Garden, Glasnevin.

CHARACTER GENERICUS.

QUERCUS. *Tournefort. Linnæi.*

FLORES	Sexu distincti in eadem stirpe.
* MASCULI	amentacei; amenta axillaria, longa, pendula, floribus supra axim filiformen interrupte glomeratis; sæpius fasciculata.
CALYX	monophyllus, membranaceus, 4-5 fidus.
STAMINA	4-10, filamentis ex imo calyce enatis, exertis; antheræ didymæ.
** FEMINEI	solitarie aut gregatim sessiles in fulcro pedunculiformi, modò brevissimo, modò plus minus elongato, ex superiorum foliorum axillis enascente.
INVOLUCRUM	coriaceum, supra connivens, superstite foramine, limbo subintegrum, uniflorum, persistens.
CALYX	superus, plerumque 6-dentatus, dentibus styli basin arcte cingentibus, persistentibus.
OVARIUM	inferum, triloculare, ovulis in singulo loculo geminis; stylus unicus, brevis, stigmata tria reflexa.
FRUCTUS	glans ovata aut globosa, coriacea, non dehiscens, hilo lato no-

GENERIC CHARACTER

OF OAK.

FLOWERS of distinct sexes on the same tree.

* MASCULINE amentaceous; the amenta or catkins axillary, long, pendulous, with flowers above the filiform axis, interruptedly glomerous, or gathered into small round heads, oftentimes fasciculated.

CALYX of one leaf, membranaceous, 4 or 5 cleft.

STAMENS from 4 to 10, filaments arising from the bottom of the calyx, standing out; anthers didymous.

** FEMININE flowers solitary, or in sessile groups, on a peduncle-formed appendage, sometimes very short, at other times more or less elongated, springing out of the axilla of the superior leaves.

INVOLUCRUM leathery, connivent above, remaining with a hole, the limbus or edge almost entire, of one flower and persistent.

CALYX superior, for the most part six-toothed, the teeth closely surrounding the style at its base, persistent.

OVARY inferior, three-celled, the little seeds in each cell by twos, three reflexed stigmas.

FRUIT *acorn* ovate or globular, leathery, not
dehiscent

CHARACTER GENERICUS.

tata; cincta involucro, persistente (*cupula*) in craterem expanso, intus levi, extus tuberculoso, aut squamoso; uniloculariis, monosperma, (loculis et seminibus abortivis) rarissime 2-3 sperma.

SEMEN

pericarpio conforme, absque perispermo, bilobum, lobis crassis; radicula supera.

ARBORES aut FRUTICES. *Folia* alterna, stipulacea, stipulis plerumque minimis caducis simplicibus; decidua aut sempervirentia; vernalia pubescentia, mollia; autumnalia coriacea, sæpius glabra.

GENERIC CHARACTER.

dehiscent or gaping, marked with a broad eye or hilum; surrounded by the persistent involucre, which forms an expanded cup, internally smooth, externally tuberculated or squamous; one-celled and a solitary seed, (the rest of the cells and seeds are abortive) very rarely from two to three seeds.

SEED the same shape as the ovary, without a *perisperm*, two lobed, lobes thick: radicle ascending.

TREES or SHRUBS. Leaves alternate, stipulate; the stipuli, or leafy appendages, for the most part very small, caducous, or falling off soon, simple: deciduous, or evergreen; in the spring pubescent and soft; in the autumn leathery, more frequently smooth.

1. QUERCUS

A Treatise on Oaks.

1. QUERCUS OBTUSILOBA.

QUERCUS foliis subtomentosis, profunde sinuata lobatis, foliis retusis; basi acute cuneata: fructu mediocri; cupela craterata; glande brevi ovata. Tab. 1. *Michaux.*

Wangenheim, p. 78. t. 6. f. 15.*

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne obtusilobe. Chêne gris.

Upland white oak, iron oak.

HEIGHT: about 50 feet.

TRUNK: straight: bark whitish; branches regular.

FRUCTIFICATION. *Male flowers*: catkin or amentum sometimes very short. *Female flowers*. Three or four on the same peduncle, or fruit-stalk; cup nearly hemispherical; gland or acorn of a middling size.

COUNTRY. From Canada and New England to Florida,

* QUERCUS stellata. Willd. Sp. Pl. v: 4. p. 452. spec. 71. Q. foliis oblongis sinuatis subtus pubescentibus, lobis obtusis, superioribus dilatatis bilobis, calycibus fructus hemisphæricis. W.

Florida, and under the same latitudes to the west of the Allegany mountains.

OBSERVATIONS.

This tree seldom grows in low or moist situations, and its fruit is always abundant: wild animals seek for its acorns, and all the pedunculated species, besides those which are annual. Its wood is valued for all economical purposes, and it is preferred to all others, for stakes and palisades, as it does not rot for a length of time; it is also employed in the building of houses, ships, &c.

The Americans in general call this species, and the *Quercus alba* of Linnæus, *white oak*, because both have a whitish bark; but they well know how to distinguish one from the other, when they wish to apply them to the different purposes peculiar to each. Many authors have confounded these two oaks with the *Quercus robur*, or common oak, and which they resemble much in the shape of their leaves, the form of the fruit, and even the quality of the wood. *Clayton*, *Gronovius*, and *Marshal* appear to be well acquainted with the distinction, and *Wangenheim* has most satisfactorily distinguished the two species, and given an exact figure of each.

2. QUERCUS MACROCARPA.

Quercus foliis subtomentosis, profunde lyratimque sinuato-lobatis, lobis obtusis, subcrenato repandis: fructu maximo: cupula profundius craterata, superne crinita: glande turgida ovata. Tab. 23. *Michaux.* *

Chêne Frisé. Chêne à gros fruit.

Over-cup White Oak.

HEIGHT: from 50 to 80 feet.

BARK smooth, and but little cracked, even in the adult state.

LEAVES lyrated, and of a bright colour: sinuses deep, and lobes obtuse, and as it were crenated; much larger than those of the preceding

* WILLDEN. Sp. Pl. v. 4. 453. Spec. 73.

Q. foliis oblongis sinuatis subtus pubescentibus, lobis oblongo-lanceolatis acutis, superioribus dentatis, calycibus fructus hemisphæricis squamosis margine setosis. W.

Michaux the younger observes, that this oak is the only species which ever grows in the most fertile districts of East Tennessee, or Holston; and which last place is inferior in every respect to Cumberland and Kentucky in fertility. However he found it growing in cool mountainous places, and by the sides of the rivers, which have not steep banks, at Kentucky and Cumberland, with acorns as large as a hen's egg. The state of Kentucky is situated between $36^{\circ} 30'$ and $39^{\circ} 30'$ of latitude, and between the 82° and 89° of longitude.

ing species, of a dark green, and less rough to the touch; with petioli, or leaf-stalks, much longer.

FRUCTIFICATION. Fruit very large: cup deep and hairy near its edge: acorn oval; sometimes more swelled; shut up in its cup, before it becomes ripe: peduncle, or fruit-stalk rather long.

COUNTRY. All the countries to the west of the Allegany mountains, Kentucky, Tennessee, Illinois, &c.

OBSERVATIONS.

This oak yields wood of a good quality, when it grows in elevated clays, and calcareous soils, as those of Kentucky and Tennessee; but in marshy grounds it appears weakly, and covered with lichens. Michaux seems to think, that in such situations the wood is not good, and its growth is retarded. Its young branches are covered with a fungous-like substance, like those we meet with on the elm, and liquidamber, which disappears in proportion as they become more full grown. There are found under the leaves of this species of oak small galls, in shape like lentils, and very hairy, and also very large ones, like the galls of other oaks, but they are light, membranous, and empty; yet ink can be made of them.

3. QUERCUS

3. QUERCUS LYRATA. *Walter.*

Quercus foliis subsessilibus, glabris, lyrato-sinuatis; summitate dilatata, divaricato-triloba: lobis acutangulis, terminali tricuspide: cupula depresso-globosa, muricato-scabrata: glande subtecta. Tab. 4. *Michaux.* *

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Blanc Aquatique. Chêne lyre.

Water white Oak.

HEIGHT: from 50 to 60 feet.

BARK smooth, young trunk, and flexible branches.

LEAVES of a pleasant green, entirely smooth and lyrated; lobes rather square, with sharp angles, the terminal lobe furnished with three points; sinuses very obtuse: petiolus, or leaf-stalk short.

FRUCTIFICATION. Cup of a middling size, almost spherical, aristated, or bristled with sharp tubercles,

* Willd. Sp. Pl. v. 4. 453. Spec. 72.

Q. foliis oblongis sinuatis glabris, lobis oblongis acutis, superioribus dilatatis angulato-truncatis, calycibus fructus nucis magnitudinis globosis tuberculoso-muricatis.

Michaux the younger notices this species but once in his Travels, growing in the Pine Barrens, or swamps in Carolina and Georgia.

bercles, and surrounding almost entirely the acorn: peduncle sometimes very short.

COUNTRY. South Carolina and Georgia, where the country is frequently deluged by the great rivers.

OBSERVATIONS.

Michaux always observed this oak in watery situations, or such as were exposed to inundations. Though, when he cultivated it in a dry soil, it has surpassed, by the rapidity of its growth, most of the other species, which were reared in the same nursery.

4. QUERCUS ALBA, (*pinnatifida*) Linnæus.

Quercus foliis subæqualiter pinnatifidis; laciniis oblongis, obtusis, plerumque integerrimis. Fructu majusculo; cupula craterata, tuberculosa-scabrata; glande ovata. Tab. 5. f. 1. *Michaux*.*

Wangenheim, p. 12. t. 3. f. 6. Catesby's Carolina,

* Willd. Sp. Pl. v. 4. 448. Spec. 62.

Q. foliis oblongis pinnatifido sinuatis subtus pubescentibus lobis lineari-lanceolatis, obtusis integerrimis, basi attenuatis, calycibus fructus pedunculatis, tuberculis basi planis. W. Gaudet foliis profunde pinnatifido-sinuatis, laciniis æqualibus, subtus glaucis pubescentibus. W.

rolina, &c. v. 1. p. 21. t. 21. f. 2. * Du Roi,
Harb. 2. p. 270. t. 5. f. 5.

ARBORETUM, HORTUS GLASNEVINENSIS,

Chêne Blanc à feuilles pennatifides.

White Oak.

HEIGHT: about 60 feet.

BARK whitish, detaching itself in longitudinal layers, as the tree becomes old.

LEAVES almost uniformly winged, obtusely indented, often entire, smooth and glaucous green underneath.

FRUCTIFICATION. *Male flowers*: from five to ten stamina. *Female flowers*: one or two on each peduncle. Cup almost hemispherical, and tuberculated; acorn oval, rather large; peduncle sometimes very short.

COUNTRY. From Canada to Florida.

OBSERVATIONS.

Catesby long since observes, that this species of oak comes nearest to our common English oak, in the shape of its leaves, acorns, and manner of growth. The bark is white, grain of the wood fine, for which, and its durability, it is esteemed the best oak in Virginia and Carolina. It grows on all kinds of land, but mostly on high, barren grounds, amongst high pine trees. There is another variety of white oak, which in Virginia is called the *Scale's White Oak*, with leaves like this: the bark is white and scaly; the wood of great use in building; grows on rich land, both high and low. *Catesby*, l. c. Michaux jun. mentions it as growing in most parts of America, in various soils.

OBSERVATIONS.

We may compare this species to the European oak with long peduncles, and from which it differs but little, in the form of its leaves, the acorn, and even the quality of the timber. In America it is preferred to all others, for the building of ships and houses; in fact, it answers for all economical purposes. It affords excellent timber for making hogsheads, for holding spirituous liquors; whereas, those which are made of red, and many other species of oak, are only fit for dry merchandize; moreover, the elasticity of the fibres of the white oak is such, that baskets and brooms are made of it. Of all the American oaks, this is the species best known time immemorial. Parkinson tells us, that the Indians boil the acorns, and get an oil from them, which they use in various ways, in preparing their food; in fact, it is very sweet.

QUERCUS ALBA, (*repanda*), Tab. 5. f. 2.

Michaux. *

Chêne Blanc à feuilles sinuenses.

This variety of white oak is frequently to be met with, in the forests of Carolina. Its leaves
are

* Willd. Sp. Pl. v. 4. 449. Q. alba, v. β . *repanda*, foliis levissime lobatis, utrinque viridibus, subtus pubescentibus brevissime sinuatis. W.

are sinuated, or sinulated; and in this state it is to be seen in the plantations of foreign trees, in France. Du Roi's Figure, pl. 5. f. 5. may be referred to.

5. QUERCUS PRINUS. *Linn.*

*Quercus foliis oblongo-ovalibus, acuminatis acutisve, subuniformiter dentatis, deciduis: cupula craterata, subsquamosa; glande ovata.**

1. QUERCUS PRINUS (*palustris*).

Foliis longiuscule petiolatis, ovalibus: fructu magno; cupula modice concava, conspicue squamosa. Tab. 6. *Michaux*. Catesby's Carolina, &c. v. 1. p. 18. t. 18. † Du Roi, Harb. 2. p. 276. c. 6. f. 3.

* Willd. Sp. Pl. v. 4. 439. Spec. 40. *Q. foliis ovatis acutis subtus pubescentibus grosse dentatis, dentibus subæqualibus, dilatatis apice callosis, calyce fructus basi attenuato, nuce ovato. W.*

† This oak grows only in low and very good land, and is the tallest and largest of the oaks in these parts of the world: the bark is white and scaly, grain of the wood not fine, though the timber is of great use. *Catesby*, l. c.

Michaux jun. states that this oak, with the *Magnolia grandiflora*, *Nyssa biflora*, &c. grow only on the river swamps, in the *Pine Barrens or Swamps*, in the Carolinas and Georgia, the soil of which is of a good quality, and always fresh humid and shaded. And again, in the districts, where there are no pines, the

f. 3. Wangen. 15. 6. 4. f. 8. Du Hamel. Arb. 18.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Chataignier (*des swamps*).

Swamp's Chesnut Oak.

HEIGHT: from 70 to 90 feet.

BARK whitish, detaching itself in longitudinal layers, when the tree becomes old.

LEAVES with rather long footstalks, inversely egg-shaped, bristly in the spring, smooth during the summer, sometimes tomentous or downy in old trees.

FRUCTIFICATION. Stamina from five to ten. Fruit large. Cup a little concave, very scaly. Peduncles or fruitstalks very short.

COUNTRY. The lower parts of the two Carolinas, Georgia, Florida, in moist and very shady forests.

OBSERVATIONS.

This is one of the loftiest oaks, which grows in the southern part of the United States. It is remarkable for the beauty of its form, and the large size of its acorns, which are pleasant and abundant, and of course much sought after by wild

the soil is not so arid, but deeper and more productive, this chesnut oak, with the white and aquatic oaks, are found.

He mentions a variety of this oak, *Quercus prinus aquatica*, not noticed in his father's '*Histoire des Chênes de l'Amerique Septentrionale*.'

wild beasts, but particularly by hogs, who live the whole year almost in the forests. The wood is excellent, and very much employed in cartwright work; and it may be divided to such a degree, that the Americans make baskets and brooms of it.

2. QUERCUS PRINUS (*monticola*). *

Foliis brevi petiolatis, subrhombico ovalibus; fructu majusculo; cupula turbinata, scabrosa; glande oblonga. Tab. 7. *Michaux*. Abbott's Insects, v. 2.p. 163. t. 82.

Chêne Chataignier (*des montagnes*.)

Mountain Chesnut Oak, Rocky Oak.

HEIGHT: from 40 to 50 feet.

LEAVES glaucous underneath; nearly rhomboidal.

FRUCTIFICATION: from 5 to 10 stamina; cup turbinated, obtusely dentated, and the stalk short; acorn oblong, and tolerably large.

COUNTRY. From the state of Massachusetts to Virginia, and in both the Carolinas, on the high mountains.

OBSERVATIONS.

* *Quercus montana*, Willd. Sp. Pl. v. 4. 440. spec.

Q. foliis obovatis, acutis, subtus albo-tomentosis grosse dentatis, dentibus subæqualibus dilatatis apice callosis, calycibus fructus subhemisphæricis, nuce ovata. W.

The younger Michaux states, that this variety is found in the arid and mountainous lands, in the east of Kentucky and Cumberland.

OBSERVATIONS.

The acorns are very abundant—the wood is as good as the white oak, and the bark is highly esteemed amongst tanners. It grows abundantly on the highest mountains: cultivated in Europe, it might turn to good account.

3. QUERCUS PRINUS (*acuminata*).

Foliis longe petiolatis, basi obtusis, acutissime serratis; fructu mediocri; cupula subhemisphærica. Tab. 8. *Michaux*. *

Chêne Chataignier (*des Illinois*.)

Narrow live Chesnut Oak.

HEIGHT: from 70 to 80 feet.

LEAVES smooth and glaucous, sometimes whitish, with a lengthened footstalk, and at the base obtuse and sharp-toothed.

FRUCTIFICATION. Ten stamina, sometimes less. Peduncle shorter than in the former variety; fruit of a middling size; cup small, nearly hemispherical.

COUNTRY. All to the west of the Allegany mountains.

OBSERVATIONS.

* *Quercus castanea*. Willd. Sp. Pl. v. 4. 441. spec. 44.

Q foliis oblongo-lanceolatis, acuminatis subtus tomentosis, grosse dentatis, dentibus subæqualibus, dilatatis apice callosis, calyce fructus hemisphærico, nuce ovata. W.

OBSERVATIONS.

The different varieties of the chesnut oak, particularly this and the last, unite many qualities. The wood is excellent, acorns sweet, and the bark much employed in tanning. The degree of heat of the lake Ontario, and the Alleghany mountains, where they grow, being the same as the north of Europe, it would be attended with advantage to cultivate them there.

4. QUERCUS PRINUS (*pumila.*)

Foliis modice petiolatis, sublanceolatis, subtus glaucis: fructu præcedentis. Tab. 9. f. 1. *Michaux.* *

Chêne Chinquapin.

Chinquapin Oak.

HEIGHT: about three feet.

LEAVES glaucous, sublanceolate, and the stalk short.

d 2

FRUCTIFICATION.

* *Quercus Prinoides.* Willd. Sp. Pl. v.. 440. spec. 41.

Q. foliis obovatis glabris grosse dentatis, dentibus subæqualibus dilatatis apice callosis, calyce fructus hemisphærico, nuce ovata. W.

The younger Michaux found, at the bottom of the high mountains, which separate N. Carolina from the State of Tennessee, leaving Knoxville, the soil is uneven, stony and bad, a great abundance of this Chinquapin oak, and which, he observes, seldom grows higher than three feet; and some of them were so loaded with acorns, that they were bent down to the ground.

FRUCTIFICATION. The fruit the same as the former.

COUNTRY. The western parts of Virginia and Carolina.

5. QUERCUS PRINUS (*tomentosa*).

Foliis subsellibus, ovalibus, dentibus obtusissimis, subtus tomentosis. Tab. 9. f. 2. *Michaux*. *

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Chataignier' (*velu*).

Downy Chesnut Oak.

OBSERVATIONS.

This variety grows abundantly in the Illinois country in an immense watery plain. The leaves are very woolly, oboval, with very obtuse teeth, the leafstalk very short; the acorns sweet, and fit to be eaten. There grows in lower Virginia a chesnut-leaved oak like this, which Michaux saw only at the end of winter. This variety, perhaps, is the chesnut-leaved oak, which is cultivated in France, whose leaves also are very woolly, but much sharper at the base.

QUERCUS VIRENS. Aiton.

Quercus foliis perennantibus, coriaceis: ovato oblongis;

* *Quercus bicolor*. Willd. Sp. Pl. v. 4. 440. spec. 43.

Q. foliis oblongo-obovatis, subtus albo-tomentosis, grosse dentatis, dentibus inæqualibus dilatatis, apice callosis, fructibus geminatis longe pedunculatis. W.

oblongis; junioribus dentatis, vetustioribus integris; cupula turbinata; squamulis abbreviatis; glande oblonga. Tab. 10. & 11. *Michaux.* *
Catesby's Carolina, &c. v. 1. p. 17. t. 17. †

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne verd de Caroline. Chêne maritime.

Live Oak.

HEIGHT: from 35 to 40 feet.

BARK brown or blackish; but little cracked.

LEAVES persistent, coriaceous or leathery, entire, oval or oblong, and a little obtuse; toothed before

* Willd. Sp. Pl. v. 4. 425. spec. 5.

Q. foliis perennantibus, coriaceis lanceolatis integerrimis, margine revolutis, basi obtusis, apice acutis subtus stellatim pubescentibus, nuce oblonga. W. RAMI teretes, fusco-cinereascentes. FOLIA breve petiolata pollicaria, vel sesquipollicaria, perennantia coriacea, lanceolata integerrima, margine revoluta reticulato-venosa, supra nitida glabra, subtus pilis stellatis dense obsita. In frutice juniore folia grosse sunt dentata, in adulto integerrima. W.

† The usual height of the live oak is about forty feet; the grain of the wood coarser, harder, and tougher than the other oaks. Upon the edges of the salt marshes, where they usually grow, they are of a large size. Their bodies are irregular, and generally long, occasioned by the looseness and moistness of the soil, and tides washing their roots bare. On higher lands they grow erect, with a regular pyramidal head retaining their leaves all the year. The acorns are the sweetest of all the others; of which the Indians lay up stores, to thicken their venison broth, and prepare them in other ways. They likewise draw an oil from them, very pleasant and wholesome, little inferior to our olive oil. *Catesby*, l. c.

before they become old ; bristly in the spring, then of a dark green colour, and slightly woolly underneath ; stalk short and reddish, as well as the nerves of the leaves.

FRUCTIFICATION. *Male flowers*, from four to five stamina ; *female flowers* with elongated penduncles ; cup turbinated, with shortened scales ; acorn oblong.

COUNTRY. From lower Virginia to Florida and the Mississippi, at a short distance from the sea.

OBSERVATIONS.

The live oak is not found in places remote from the sea—it grows abundantly in the islands, and tracts of land exposed to the tempestuous storms of the ocean. The low countries of North America are lands of a late formation, forsaken by the sea at no very distant period, considering the antiquity of the globe. The whole surface of the soil is a sandy stratum, under a very deep mass of clay. The maritime oaks make here a rapid progress, because the fibrous roots, with which they are furnished, during their very young state of growth, find in a moveable sand no difficulty of extending themselves in every direction ; and accordingly as they arrive at maturity, the principal roots reach the clayey bottom, from whence they receive nourishment, which maintains their vigour for many centuries. It is thus that they become capable of resisting the efforts

efforts of violent winds, and of enduring the heat of scorching suns. From Virginia to the extremity of Florida, the traveller often sees this species of oak standing by itself, and vigorous in a soil, where no other tree can exist. It is never injured by animals, and in all the houses situated in the low parts of both Carolinas and Georgia, the inhabitants look to it, to answer as a shelter for cattle during the winter, and to secure them from the intense heat of the summer. The leaves become very thick, and impenetrable to the rays of the sun: the shade of a single tree often covers a space of thirty fathoms, or 180 feet; the fruit, always abundant, is less astringent than many of the species of oak. The savages of Florida procure from it an oil, which they mix with their food; and hogs, and many other animals likewise seek after the acorns. Its timber is of an excellent quality, and more esteemed than that of any other species of oak which grows in North America. In the south of the United States, it is employed with the greatest advantage for building ships, which last for a considerable length of time uninjured. It is generally cut the latter end of autumn, and is not made use of for three months afterwards. Michaux observes, that the soil of lower Carolina and Georgia being the same as the lands of Bordeaux, this maritime oak merits the attention of the French and Spanish governments, as affording

ing the means of turning to good account the sandy lands, which border the Mediterranean and the ocean.

The name of *Bannister*, the first author who knew this oak, can only be applied to it when in a younger state; for its leaves are entire when fully grown. It happens also very frequently, that when a branch happens to be cut or broken, at this last period, the shoots, which spring up afterwards, produce on the very first year sinuated and oblong leaves, as in the young trees.

One may know this oak in the gardens of Europe, by its oblong and shining leaves, the petioli, or footstalks of the leaves, and the nerves of which are reddish. It is easily distinguished from the ever-green oak, (*Quercus ilex* of Linnæus) whose leaves are opaque, and of a dark colour.

7. QUERCUS PHELLOS. Linnæus.

Quercus foliis lineari-lanceolatis, integerrimis, glabris, apice setaceo-acuminatis; junioribus dentatis aut lobatis; cupula scutellata; glande subrotunda.

1. QUERCUS PHELLOS, (*sylvatica*).

*Quercus foliis angusto-lanceolatis, utrinque acutis, deciduis. Tab. 12. Michaux. * Wangerheim, p. 76. t. 5. f. 11.*

Abbot's

* *Quercus Phellos*, Willd. Sp. Pl. v. 4. 423. Spec. 1.

Q. foliis deciduis lineari-lanceolatis utrinque attenuatis integerrimis

Abbot's Insects, v. 2. p. 181. t. 91. Catesb.
Carol. v. 1. p. 16. t. 16.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Saule à *feuilles* caduques.

Willow Oak.

HEIGHT from 40 to 50 feet.

BARK smooth.

LEAVES narrowly lanceolated, sharp at both ends,
trifid and sometimes much divided when young,
footstalk short.

FRUCTIFICATION. *Male flowers*; from 4 to 5
stamina. *Female flowers*; two on a very short
peduncle. Cup slender. Acorn small.

COUNTRY. From New Jersey to Florida.

OBSERVATIONS.

tegerrimis, glabris mucronatis, nuce subrotunda. W. FOLIA
fructicis junioris, vel remote grosse dentata, vel cuneata tri-
loba. W.

Catesby, l. c. never found it but in low moist land, leaves
long, narrow, and smooth-edged; in shape like a willow; the
wood is soft, and coarse grained, and of less use than most
of the other kinds of oak. In mild winters they retain their
leaves in Carolina, but in Virginia they drop.

A variety of this species is noticed by Catesby, *Quercus hu-
milior, salicis folio brevior*, Highland willow oak, p. 22. tab.
22. which, he informs us, is usually a small tree, having a
dark coloured bark, with leaves of a pale green, and shaped
like those of a willow. It grows on poor land, producing but
few acorns, and those small.

Willdenow, Sp. Pl. v. 4. 424. takes notice of this variety,
(var. β . of his *Q. Phellos*) and refers to Wangenheim, 77. t.
5. f. 12.

OBSERVATIONS.

This oak grows most generally in wet situations, alternately inundated by rain. Its growth is slower than other species, but when it arrives at maturity, it forms a beautiful tree. When grafted on the common oak (*Quercus Robur*) it is always more vigorous, than that which has not been grafted. The wood is good, and very much in use and succeeds well in France. In the garden of Trianon near Versailles, there exists a stump (*pied*) of this tree, which rises to about 45 feet.

2. QUERCUS PHELLOS (*maritima*.)

Quercus foliis latiuscule lanceolatis, perennantibus. Tab. 13. f. 3. *Michaux.* *

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Saule à feuilles persistantes.

Chêne Saule *maritima*.

This differs from the former, in this particular, that its leaves do not fall, and they are very short. It is found in Carolina in the vicinity of creeks formed by the tide, and bears fruit at three feet high.

* *Quercus maritima.* Willd. Sp. Pl. v. 4. 424. spec. 2.

Q. foliis perennantibus coriaceis lanceolatis integerrimis basi attenuatis, apice acutis mucronatis, glabris, nuce subrotunda. W.

high. On close examination, perhaps it may turn out to be a new species. Michaux never cultivated it.

3. QUERCUS PHELLOS (*pumila*.)

Quercus fruticulosa: foliis oblongis, basi obtusis. Tab. 13. f. 1. 2. *Michaux*. * *Abbot's Insects*. v. 2.p. 101. t. 51.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Saule nain. *Chene saule stolonifere*.

We ought to consider also, as a variety of the willow-leaved oak, the *Quercus pumila* of Walter—it is very small and stoloniferous or creeping; leaves oblong, with an obtuse base, and at first view they appear to be glaucous, but on more attentive examination they turn out to be soft and silk.

8. QUERCUS CINEREA.

Quercus foliis petiolatis; lanceolato-oblongis, acutis integerrimis; subtus cinereo-pubescentibus: Cupula scutellata, squamis marginalibus introrsum manifestis; Glанде sphaerica. Tab. 14. *Michaux*. †

Chêne

* *Quercus sericea*. Willd. Sp. Pl. v. 4. 424. spec. 3.

Q. foliis deciduis lanceolatis integerrimis basi obtusis, apice, acutis subtus sericeis, nuce subrotunda. W.

† Willd. Sp. Pl. v. 4. 405. sp. 6.

Q. foliis perennantibus coriaceis lanceolatis integerrimis, margine

Chêne Cendré.

Upland Willow Oak.

HEIGHT from 15 to 20 feet.

LEAVES petiolated, oblongly lanceolated, sharp, entire; of a dark green colour above, cinereous and downy underneath.

FRUCTIFICATION. *Male flowers:* 4 stamina. *Female flowers,* like to the willow-leaved oak. Cup; saucer-shaped, marginal scales visible within. Acorn spherical.

COUNTRY. The low part of the two Carolinas, and of Georgia.

OBSERVATIONS.

This oak is of a disagreeable form, grows only in dry and arid places, particularly on such grounds, which, having been cultivated, were deserted on account of the bad quality of the soil—its wood is used for firing only.

Linnaeus

margine revolutis basi attenuatis apice obtusiusculis mucronatis, subtus stellatim tomentosis, nuce subrotunda. W.

RAMI teretes cinerascetes remote punctati. FOLIA petiolata sesquipollicaria coriacea integerrima lanceolata, subtus pilis stellatis densissime obsita. Differt a *Quercu virente*: foliis majoribus latioribus basi attenuatis, apice obtusis, subtus dense tomentosis, calyce fructus minus basi attenuato, et nuce subrotunda minore. In planta juniore apice dentata. W.

Linnaeus has referred to Catesby's figure and description for this species of oak, but the figure in particular is very inaccurate.

9. QUERCUS IMBRICARIA.

Quercus foliis subsessilibus, ovali oblongis, acutis integerrimis, subtus pubescentibus: Fructu præcedentis; squamis cupulæ paulo majoribus. Tab. 15. and 16. *Michaux.* *

Chêne a Lattes.

Shingles Willow Oak.

HEIGHT: 40 feet.

BARK grey, but little cracked; branches straight.

LEAVES almost sessile, large, oblong-oval, sharp, entire, of a dark green colour above, a little downy underneath.

FRUCTIFICATION. Fruit like the former species, but the scales of the cup a little larger.

COUNTRY. The Allegany mountains, and the countries to their west.

OBSERVATIONS.

The wood of this oak is made use of by the Illinois French, in preference to that of the marsh oak (*Quercus palustris* Du Roi) and which abounds in the same country. They make laths of

* Willd. Sp. Pl. v. 4. 428. spec. 13.

Q. Foliis oblongis acutis mucronatis integerrimis subtus pubescentibus, nuce subrotunda. W.

Folia subtus pubescentia basi tantum acuta nec attenuata et *Calyce* fructus squamis magnis imbricatis composito. W.

of them, which they call *essentes* or shingles, which serve for covering their houses. On the river Wabash, and at the mouth of the Cumberland river, and in the Ohio, at 400 leagues distance from the ocean, Michaux particularly discovered this species of oak, which he observes is very rare to the east of the Allegany mountains.

10. QUERCUS LAURIFOLIA.

*Quercus foliis subsessilibus, ovali-lanceolatis, inferne in acutum angustatis integerrimis, glabris: Cupula subturbinata; Glандe subglobosa. Tab. 17. Michaux.**

Chêne Laurier à feuilles aigues.

Swamp's Willow Oak.

HEIGHT: about 60 feet.

BARK smooth; branches straight.

LEAVES almost sessile, egg-lance shaped, contracted at the base into an acute angle, entire, smooth, and shining.

FRUCTIFICATION: Cup a little turbinate; acorn almost globular, a little longer than that of the willow oak.

COUNTRY. Shady forests, and the sea shores in South Carolina and Georgia.

OBSERVATIONS.

* Willd. Sp. Pl. v. 4. 427. spec. 12.

Q. Foliis oblongis basi attenuatis integerrimis glabris, nuce subrotunda lævi. W.

Folia tri-vel quadripolicaria utrinque glabra Lauri. Variat foliis apice attenuatis vel obtusis. W.

OBSERVATIONS.

The wood of this oak is of a good quality; yet it does not possess all the valuable properties of the ever-green oak of N. America. It is the last, which has any affinity with the willow-leaved oak, either in the form of its leaves, or the parts of fructification.

QUERCUS LAURIFOLIA * (*hybrida*) Tab. 18.

Michaux.

Chêne Laurier à feuilles obtuses.

This species is found on the sides of brooks, which flow in arid sands—it differs from the former in the leaves being widened, with obtuse summits. One would be tempted to consider it as a hybrid species, produced by the aquatic with the laurel-leaved oak, because the same leaves are found both in the one and the other; but in the aquatic oak, they are found but accidentally on the young trees, whereas they form the essential character of this in its full grown state; and

* The younger Michaux, in his travels to the *Westward of the Allegany Mountains, &c.* remarks on the Tennessee side of the barrens, or meadows of Kentucky, the chain of woods is formed exclusively of this species of oak, which there is called *post oaks*, the wood of which being very hard, and not perishing easily is preferred to all others in the formation of fences; it thrives among pines in very bad soils—and again that it grows in the two Carolinas and Georgia.

and besides, it resembles in every respect the laurel-leaved oak, and is therefore evidently a variety.

II. QUERCUS AQUATICA. Catesby.

Quercus foliis obovati-cuneatis, basi acutis: summitate subintegris varievetrilobis; glabris. Cupula modice craterata, glande subglobosa. Tab. 19. 20. and 21. *Michaux.* *

Wangenheim 80. t. 6. f. 18. Catesby's Carolina, &c. v. 1. p. 20. t. 20. †

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Aquatique.

Water Oak.

HEIGHT: from 55 to 60 feet.

LEAVES small, wedge-shaped, sharp at the base,
summit

• Willd. Sp. Pl. v. 4. 441. spec. 45.

*Q. Foliis cuneiformibus glabris apice obsolete trilobis, lobo intermedio majore calyce fructus subhemisphærico, nuce subrotunda. W. Planta e semine educata prima anna folia oblongo-lanceolata subintegerrima, altero ætatis anno folia oblonga integerrima, dentata, et sinuata, tertio quarto et quinto lanceolata subsinuata et triloba profert. Junior planta at *Q. Phellum* accedit. W.*

† Grows in low watery lands, the timber is not durable, therefore of little use except for fences. In mild winters all the varieties retain most of their leaves. The acorns are small and bitter, and rejected by the hogs where others are to be found. *Catesby*, l. c. 1.

summit a little sinuated, or variously three-lobed; footstalk short.

FRUCTIFICATION. *Male flowers*: generally 5 stamina. Cup a little concave; acorn almost globular.

COUNTRY. From Maryland to Florida.

OBSERVATIONS.

When the lobes of the leaves are obtuse, the points which terminate them fall in spring, or even when coming forth. This oak is found in large tracts of ground in the low parts of the Carolinas and Georgia, which have been inundated by the rivers. It is also found in dry sandy situations, and on the downs which border the sea in Florida. It is improperly called aquatic, the willow-leaved oak being equally an aquatic; but Michaux thinks it would be improper to change the names given to it time immemorial, and which have been adopted by travellers and botanists. The oaks of North America, for the most part, produce on the young trees leaves very different from those of the old ones; but there is such a sporting of nature in the varieties of the aquatic oak, that obtuse and acute leaves are often found on the same individual in their very young state; lanceolated and entire leaves, mixed with others, which are sinuated, &c. (*see plates 20 and 21. Michaux.*) Aiton in his *Hortus Kewensis* has distinguished many of these varieties by peculiar names, but

not being constant, they ought not therefore be adopted.

The wood of this oak is but little esteemed; it would however be very useful if it were cut, when the flow of the sap is obstructed; but this method is not practised in America, for they there cut down the trees equally in summer as in winter, in order to employ them immediately in the building of their houses and ships.

This oak has been confounded with the black species, but *Clayton*, *Catesby*, &c. who have travelled in America, distinguished the difference, as well as the people of the country.

A variety with narrow leaves, irregularly indented, and which retains them during the whole winter, is found on the sandy downs in Georgia and Florida. It is highly probable that this variety, which *Bartram* calls *Quercus dentata* (*narrow-leaved winter green oak*), and in another place *Quercus dentata*, *s. hemisphærica*, ought to be referred to *Michaux's* aquatic oak. See *Bartram's Travels*, p. 14, 28, and 320.

12. QUERCUS NIGRA. *Catesby*.

Quercus foliis coriaceis, cuneatis, dilatata retuso-subtrilobis, basi retusis; subtus rubiginoso-pulverulentis: cupula turbinata, squamis apice obtuso scariosis; glande brevi ovata, T. 22. and 23. *Michaux* *

Abbot's

* Willd. Sp. Pl. v. 4. 442. spec. 46.

Abbot's Insects, p. 115. t. 58. Wangenheim,
p. 77. t. 5. f. 13. Catesby's Carolina, v. 1.
t. 19. *

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Noire.

Black Oak.

HEIGHT : about 30 feet.

TRUNK tortuous ; bark rough and blackish.

LEAVES leathery, reddish and powdery underneath ; wedge-formed : base obtuse, and more or less sloping inwards, extremity very wide.

FRUCTIFICATION. *Male flowers* ; 4 stamina. *Female flowers*, almost sessile. Cup turbinate, scales with obtuse and membranous summits ; acorn oval.

COUNTRY. From Maryland to Florida. Found even in Jersey.

OBSERVATIONS.

Q. Foliis cuneiformibus glabris basi subcordatis, apice subtrilobis, lobis divaricatis mucronatis brevioribus. *Mucrones* in apice foliorum juniorum ætate decidunt. W.

* Generally grows on the land, and is small ; the colour of the bark is black, the grain coarser, and the wood of but little use but to burn ; soon produce leaves ten inches long. *Catesby*, l. c.

Speaking of the BARRENS or meadows of Kentucky, which Michaux junior considers as extremely fertile, consisting of a stratum of vegetable earth, resting on a calcareous mass, the *Quercus nigra*, black or scrub oak, and the *Juglans hickory* rising to above twelve or fifteen feet high, growing here and there in the meadows, which in the forests are evidences of the worst soil.

OBSERVATIONS.

The setaceous, or bristly points, which terminate the lobes of the leaves, generally fall off in the spring—even sometimes there are no points, when the lobes are not terminated by the protuberance, which marks out the lengthening of the nerves.

There is a variety with sharper lobes, and whose points continue—it nearly approaches the three lobed oak; nevertheless it more strongly resembles the black or the aquatic oak. Michaux found this in the state of Tennessee, at a short distance from Nashville.

In the Carolinas, Georgia, and Florida, the black oak grows in dry and sandy grounds, amongst the longleaved pines; its wood is bad, and only used for firing—often when cut down, it breaks like rotten wood.

13. QUERCUS TINCTORIA. Bartram.

*Quercus foliis petiolatis, subtus pubescentibus, lato-ovalibus, leviter et subrotunde lobatis, basi obtusis: cupula subscutellata aut turbinata; glande depresso-globosa aut ovata. **

1. QUERCUS

* *Quercus tinctoria*. Willd. Sp. Pl. v. 4. 444. spec. 51.

Q. Foliis obovato-oblongis levissime sinuatis subtus pubescentibus; lobis oblongis obtusis obsolete denticulatis setaceo-mucronatis calyce fructus subtus pleno. W.

Michaux, the younger, states that the valleys at New Jersey

1. QUERCUS TINCTORIA, *angulosa*.

Quercus foliis leviter lobatis, lobis angulosis: capula subscutellata; glande depresso-globosa, Tab. 24. *Michaux*.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne

Jersey are particularly stocked with this Quercitron, called in the country, black oak, and it is very common in all the northern states—he says it is also found in the westward of the Allegany mountains but less plentiful in the two Carolinas and in Georgia, and that the figure given of it in his father's work, *Histoire des Chênes*, represents the leaves of the lower branches only, and the forms which they have in young trees. Among the great number of species and varieties of oaks, of which the forms of the leaves differ, according to their age, which causes them to be frequently confounded with each other; there are characteristic signs, by which the quercitron oak can always be distinguished. In all the other species, the footstalks, the nerves, and the leaves themselves are of a paler or deeper green, and towards autumn this colour becomes darker, and passes to a more or less distinct red: on the contrary, the footstalks, the nerves, and the leaves of the quercitron are yellowish from their expanding, and as if they were pulverulent, and the yellow colour becomes deeper as the winter approaches. This remark is sufficient to prevent mistakes, but there is also another more certain, and by which this species may be known in the winter, when it has lost its leaves—this is the bitter taste of the bark, and the yellow colour it communicates to the saliva, when it is chewed. Michaux thinks that he found the same property in the bark of the *Quercus cinerea*. At any rate, these two species of oak cannot be mistaken for each other; for the one grows only in the driest and most arid places

Chêne Quercitron à feuilles anguleuses.

Great black oak. Champlain black oak.

HEIGHT: from 60 to 80 feet.

BARK blackish.

LEAVES petiolated or with footstalks, widely inversely oval; lobes not very deep and angular; of a dark green above, lightly pubescent underneath.

FRUCTIFICATION. *Male flowers*: 4 stamina.

Cup almost saucer-shaped, very scaly, scales but slightly cohering. Acorn round and a little depressed.

COUNTRY. The lake Champlain, Pennsylvania, and the high mountains of both Carolinas and Georgia.

OBSERVATIONS.

The people of Pennsylvania and the high mountains call this *black oak*; but the real black oak is

places in the southern states; it rarely exceeds four inches in diameter, and eighteen feet in height, and its leaves are lanceolate; while the *quercitron* rises to the height of twenty-four feet, and its leaves have several very long lobes. He observed at the door of a tannery at Lexington some strong hides of a yellowish colour, tanned with this oak, which proves that it grows in Kentucky, though Michaux did not observe any between Lime-street and Lexington. Quercitron does not grow on arid, or extremely fertile soils; but thrives most in mountainous districts, where the land is gravelly and a little moist."

is that of Catesby, and the people of Lower Carolina, and which grows in very dry sands, whereas this grows only in good grounds, remote from the sea. Bartram measured some in Georgia, six and ten feet in diameter—what Michaux saw on the Lake Champlain were for the most part from 3 to 4 feet; but in the intervals of the high mountains of North Carolina, they acquire double that thickness. The bark of this oak is employed for tanning leather in all the northern and western parts of the United states—it affords a yellowish colour, which has got it the name of *Quercitron*, and gives a very high value to leather. This bark, bruised and reduced to powder, has been sold in France for many years to the dyers: but the war has put an end to this new branch of commerce between France and the United States.

The wood, though inferior to that of the white oak, is of wonderful resource on many occasions, besides the building of houses. *Kalm* tells us, that it is much employed for the timbering of coasting ships (*schooners*). He also speaks very favourably of this oak in his *History of Carolina*, Lond. 1719.

2. QUERCUS TINCTORIA. (sinuosa.)

Foliis profundis sinuosis; cupula turbinata; glande ovata, Tab. 25. *Michaux*.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne

Chêne Quercitron a feuilles sinueuses.

This variety is also found in the low parts of South Carolina and Georgia, at a certain distance from the sea—the leaves are generally large and more deeply sinuated. The acorns are like those of the scarlet oak, and the cup is deeper than that of the tall black oak of upper Virginia and upper Carolina, where the specimen figured in the 24th plate of *Michaux* has been collected.

14. QUERCUS TRILOBA.

Quercus foliis petiolatis, oblonge cuneatis, summitate lobato-tricuspidibus; subtus eximie tomentosis: cupula scutellata, glande globosa. Fig. 26. *Michaux* *

Abbot's Insects, v. 1. p. 99. t. 50?

Wangenheim, p. 78. t. 5. f. 14.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Trilobe.

Down Black Oak.

HEIGHT: from 50 to 60 feet; growth rapid.

BARK smooth.

LEAVES

* Willd. Sp. Pl. v. 4. 443. spec. 47.

Q. Foliis cuneiformibus apice subtrilobis, lobis æqualibus mucronatis, intermedio longiore, subtus tomentosis, calyce fructus subtus plano, nuce subrotunda. FOLIA supra viridia glabra nitida subtus dense albo tomentosa.

Q. Cuneata huic simillima et forte varietas, licet Cl. Wangenheim folia tantum pubescentia descripserit. W.

LEAVES oblong-wedge shaped, three-lobed at the top; covered (*drapees*) and ash-coloured underneath: petiolus or footstalk much longer than that of the black oak.

FRUCTIFICATION: *Male flowers:* 4 stamina. *Female flowers* almost sessile. Cup saucer-formed. Acorn globular small.

COUNTRY. From New England to Georgia.

OBSERVATIONS.

This oak is remarkable for its rapid and vigorous growth, even on bad grounds. After the conflagrations, which annually occur in America, its shoots produce during the first years, leaves very unlike those of the full grown tree—the lateral and intermediate divisions are much deeper, and the subdivisions are greatly multiplied.

It is a species of oak, which may be very usefully employed in farming enclosures of quickset hedges—a trench of about a foot broad may be prepared on the top of a ditch, in which the acorns should be sown in tolerable quantities—during the two first years, care must be taken to re-dig and weed the ground—in the course of the fourth, the young shoots must be laid down crossways (*croisees en sautoir*,) or intersecting each other; and in this manner they will form a hedge extremely close, and impenetrable, which may last for a century. Michaux advises the sowing of the acorns, as soon as possible after they have been

been collected; but in the course of the winter rats and moles after destroy large quantities of them—this circumstance may be avoided by causing them to germinate in boxes filled with light mould, and afterwards planting them.

The wood of this tree is employed to make enclosures of a zigzag form—in order to do which, the trees are cut into pieces of two feet in length, and afterwards divided into as many parts of four inches in diameter, as the tree can afford—a first line of an indeterminate length is placed on the ground which is to be enclosed, by making the end of the second piece form a zigzag direction over that of the first: the end of the third on that of the second, &c.—afterwards another range is begun on the former, and continued to the height of 4 or 5 feet; so that the whole collection of pieces, by their extremities, forms an angle (*rentrant*,) and resembles a sheep walk. The great consumption of wood in this bad method of enclosing lands does not contribute less to the destruction of forests, than the annual conflagrations. Authors have not described this oak botanically; the following passage in *Kalm's Travels* can only refer to this species. “There is found in Pensylvania a rare species of oak, known by its leaves, having a triangular extremity, and the angles terminated by a short bristle, smooth above and hairy beneath.”

15. QUERCUS BANNISTERI.

Quercus longe petiolatis, acutangulo-quinque-lobis, margine integris; subtus cinereo tomentosis: cupula subturbinata; glande subglobosa, Tab. 27. *Michaux*. *

Wangenheim 79. t. 6. f. 17. Abbot's Insects, v. 3. p. 157. t. 79?

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne De Bannister. Petit Chêne velouté.

Running Downy Oak.

HEIGHT: from 6 to 9 feet.

LEAVES with long petioli or leafstalks, divided into five lobes, forming as many acute angles, with a very full edge; downy and ash-coloured underneath.

FRUCTIFICATION: Fruit small: two on each peduncle or fruitstalk. Cup a little turbinate. Acorn almost globular.

COUNTRY. In the states of Massachusetts, New York, and New Jersey.

OBSERVATIONS.

Bannister's Oak grows in clayey and cold grounds, is always small, and would probably be

* *Quercus ilicifolia*. Willd. Sp. Pl. v. 4. 447, spec. 59.

Q. Foliis obovato-cuneiformibus tri-quinque lobisve, lobis setaceo-mucronatis subtus tomentosis. W.

Young Michaux tells us, that, this species of oak grows on the summits of the hills at Carlisle.

be very good for quicksets, as well as the *Quercus triloba*.

16. QUERCUS FALCATA.

Quercus foliis longe petiolatis, basi obtusis, divaricatis subpalmatis lobatis, lobis subfalcatis: cupula crateriformi: glande globosa, Tab. 28. *Michaux.* *

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Velouté.

Downy Red Oak.

HEIGHT · from 50 to 60 feet.

LEAVES with elongated footstalks, obtuse at the base, palmated; lobes slightly divided at the extremity, generally crooked like a scythe.

FRUCTIFICATION. Cup not very deep, scales deciduous; acorn small and globular.

COUNTRY. From Virginia to Florida.

Before this tree comes to its full growth, it produces leaves, whose lateral and intermediate divisions are subdivided; and in this state the lobes are straight, resembling much the *Q. triloba*;

* *Quercus elongata*. Willd. Sp. Pl. v. 4. 444. spec. 50.

Q. Foliis trilobis sinuatisve subtus tomentosis, lobis subfalcatis setaceo-mucronatis, terminali elongato. Planta junior folia Q. coccinæ profert, senior Q. trilobææ simillima, adulta vero satis distincta ob lobum terminalem elongatum et laterales subfalcatos. W.

loba; that in its young state of growth it is difficult to distinguish one from the other; but when they arrive at their full state of perfection, each species assumes its peculiar characteristic marks.

17. QUERCUS CATESBÆI.

*Quercus brevioribus petiolatis, basi in acutum angustatis, subpalmato-lobatis, lobis interdum subfalcatis: cupula majuscula, squamis marginalibus introflexis; glande subglobosa, Tab. 29. 30. Michaux.**

Abbot's Insects, v. 1. p. 27. t. 14. Catesby's Carolina, &c. v. 1. p. 23. t. 23.

Chêne

* Willd. Sp. Pl. v. 4. 446. spec. 55.

Q. Foliis oblongis profunde sinuatis glabris, lobis tribus quinisque divaricatis dentatis acutis setaceo mucronatis, basi cuneatis, calycibus fructus turbinatis.

The leaves of this oak, which Catesby calls *red oak*, retain no certain form but sport into various shapes more than any other oak. The bark is dark-coloured very thick and strong, and for tanning preferable to any other kind of oak—the grain is coarse, the wood strong and not durable—grows in high lands, the acorns vary in shape, as appears by the figures of them, they being from the same kind of oak. Catesby, l. c. Michaux, jun. states that seven tenths of the two Carolinas and Georgia are covered with *Pinus palustris*, and sometimes intermixed with this species of oak, the *Quercus nigra* and *Q. obtusiloba*.

Chêne de Catesby.

Sandy Red Oak.

HEIGHT: from 30 to 40 feet.

BARK blackish and rugged.

LEAVES smooth and shining, leathery, narrowed into an acute angle at the base, with three or five lobes, which are sometimes crooked like a scythe, petiolus or leaf-stalk very short.

FRUCTIFICATION: *Male flowers*; 4 stamina: cup rather large, thickened, scales of the edge folded inwards: acorn almost globular.

COUNTRY. Maryland, Virginia, and the Carolinas.

OBSERVATIONS.

Catesby's oak grows on dry and parched uplands, and often found with the black oak; the wood is of a bad quality, and used only for firing. *Catesby* has erroneously borrowed his description from *Plucknet*, which ought to be referred to the true red oak only, (*Q. rubra* Linnæi.) known as such by *Wangenheim*, and the people of Canada. *Linnaeus* has also confounded this species with the red oak.

18. QUERCUS COCCINEA. Wangenheim.

Quercus longissime petiolatis, 5—7 lobis: dentibusque acutissime angustatis: cupula turbinata, insigniter

insigniter squamosa; glande brevi-ovata, Tab. 31 and 32. *Michaux.* *

Wangenheim, 44. t. 4. f. 9.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Ecarlate.

Scarlet Oak.

HEIGHT: from 75 to 80 feet.

LEAVES smooth, with 5 or 7 lobes, the teeth and apex of which are attenuated into a point; sinuses much rounded, leaf-stalks very long.

FRUCTIFICATION: *Male flowers*: 4 stamina: cup turbinated and very scaly; acorn oval.

COUNTRY. Virginia and the elevated parts of both Carolinas—rare in the more northern situations.

OBSERVATIONS.

Where this species of oak grows, it is readily distinguished by the natives from the red oak, the branches of which are much more flexible, and besides the leaves of the *Q. coccinea* are larger, and supported on very long foot stalks—at the approach of winter they are of a tolerably deep red colour—the shape of the acorns, and particularly of the cup, affords characters so different,

* *Quercus coccinea.* Willd. Sp. Pl. v. 4. 445. spec. 54.

Q. Foliis oblongis profunde sinuatis glabris, lobis divaricatis dentatis acutis setaceo-mucronatis, calycibus fructus basi attenuatis. W.

ferent, and permanent in the scarlet oak, that they ought to be considered as two very distinct species.

The wood is preferred to that of the red oak, but the bark is less esteemed for tanning. *Wangenheim* is the first author who distinguished these two species, and the description he gives of both are exact; however he is in an error as to his figure of the acorn, which ought to be larger, as he himself confesses in his description. In general the figures of *Wangenheim* are good as to the leaves, but incorrect in what respects the fructification.

19. QUERCUS PALUSTRIS. Du Roi.

Quercus longe petiolatis, profundius septem lobis; sinubus latis lobis oblongis, acute subdivisis: fructu parvo: cupula scutellata, lævi; glande subglobosa, Tab. 33 and 34. *Michaux.* *

Wangenheim, 76. t. 5. f. 10.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne

* Willd. Sp. Pl. v. 4. 446. spec. 56.

Q. Foliis oblongis profunde sinuatis, axillis venarum subtus villosis, lobis divaricatis dentatis acutis setaceo-mucronatis, calycibus fructus basi plano turbinatis. Ab affinibus abunde diversa: foliis profunde sinuatis minoribus ex axillis venarum subtus villosis. *W.*

Chêne Des Marais.

Swamp's Red Oak.

HEIGHT: from 30 to 40 feet, very branchy, branches weeping or bending towards the ground.

LEAVES, footstalks or petioli elongated, deeply cut and forming large sinuses, divided into seven oblong lobes, with sharp teeth or subdivisions, like those of the scarlet oak, but smaller.

FRUCTIFICATION. The same as the willow-leaved oak. Cup saucer-shaped, smooth: gland or acorn small.

COUNTRY. From New England to Virginia and the countries to the west of the Allegany mountains.

OBSERVATIONS.

This oak abounds in the Illinois country. The French who live here employ it chiefly to make spokes of wheels, stakes, posts, &c. Of all the species of American oaks, it is one of those which varies the least. The *Quercus palustris*, which Michaux saw growing in France, perfectly resembles that, which grows in Pennsylvania and in the Illinois country. The figure by Du Roi, pl. 5. f. 4. is very exact.

20. QUERCUS RUBRA. Linnæus

Quercus longe petiolatis, glabris 7—9 lobis; lobis brevibus, dentibus angulisve acutissimis, sinibus subacutis: fructu majusculo; cupula scutellata sublævi; glande turgida ovata, tab. 35 and 36. *Michaux* *

Wangenheim, 14. t. 3. f. 7.

ARBORETUM, HORTUS GLASNEVINENSIS.

Chêne Rouge.

Red Oak.

HEIGHT: from 90 to 100 feet; its growth rapid. LEAVES sinuated, not so deeply cut as the two former species, with 7 or 9 lobes, teeth or angles very acute, sinuses likewise acute, sometimes obtuse, leafstalks or petioli very long.

FRUCTIFICATION

* Willd. Sp. Plant. v. 4. 445. spec. 53.

Q. Foliis oblongis obtuse sinuatis glabris, lobis acutiusculis dentatis acutis setaceo-mucronatis, calycibus fructus subtus planis.

The younger Michaux found a variety of the red oak at New Jersey, the acorns of which were swelled in the middle; and by the same information it appears, that the *Q. rubra*, or red oak is common in many parts of America; on the road to Carlisle and Philadelphia it occurs of very great height. He observes, that it is not known to many people in Europe, that vessels of considerable tonnage are built at Pittsburgh and on the Ohio. The timbers employed in their construction consist chiefly of this oak, the white, and the Quercitron oak.

FRUCTIFICATION: Fruit rather large: cup saucer-shaped, a little smooth: acorn oval and short.

COUNTRY. From Canada to Georgia, and all the countries to the west of the Allegany mountains.

ARBORETUM, HORTUS GLASNEVINENSIS.

It is one of the species of oak, worthy of being cultivated, and with advantage in every part of Europe. The wood, though inferior in quality to that of the white oak, is however much employed for carpentry and cartwright's work. Its bark is preferred to every other species for tanning—the European tanners settled in the United States observe, that it contains a much more active tanning principle, than the bark of the European oaks generally employed for that purpose. Michaux saw it growing from Malbaye, 28 leagues to the north east of Quebec, as far as the mouth of the Ohio; in the northern states, in Virginia, Kentucky, the state of Tennessee, and in the upper part of both Carolinas; it is more rarely to be met with in the lower parts of these two states——grows rapidly in sandy, ochry (*ferrugineux*) and cold grounds. Those, which Michaux sent from America, and which were planted at Rambouillet to the number of many thousands, grew most rapidly, arriving to the height of above 30 feet in less than ten

f 2

years;

years ; it must be observed however, that they were transplanted twice.

This oak is naturalized on the lands of *Duhamel*, for it bears fruit every year in this situation, and reproduces without cultivation.

Plucknet is the first who has given a figure of this species. *Catesby*, who knew nothing about it, has applied the synonyms of *Plucknet* to a very different species ; even the synonyms of *Linnaeus* are incorrect, because they may agree with many other species.

APPENDIX,

QUERCUS BALLOTA. *Desfontaines.*

Q. Foliis ellipticis perennantibus denticulatis integrisve subtus tomentosis, glande longissima. Desfont. Fl. Atlant. v. 2. p. 350.

Leaves ever green, elliptical, dentated or entire, downy underneath, with a very long acorn.

Q. Foliis ellipticis indivisis serratisque subtus tomentosis, cortice integro, nuce cylindracea. Willd. Sp. Pl. v. 4. 432.

ARBORETUM, HORTUS GLASNEVINENSIS.

This oak is allied to the *Quercus Ilex* of Linnaeus; and Desfontaines appears to be the first who takes notice of it—he observes that the leaves are downy and white underneath, the acorn almost twice as long, as that of the *Q. Ilex*, and which is sweet and pleasant; it likewise differs in height and habit from the last. It is distinguished from the *Quercus Suber*, or
cork

cork-tree, by the bark not being fungous or corky—by soil and by age it varies much—some are furnished with small orbicular leaves, others with elliptic leaves, and some again with lanceolate leaves. Desfontaines seems to think it is the *Quercus major* of Clusius Hist. 22. The natives of Mount Atlas eat the acorns both roasted and raw—the wood is compact and very hard, and used for various purposes. Desfont. l. c.

He quotes Pliny, lib. XVI. cap. V. “*Glandes opes esse nunc quoque multarum gentium etiam pace gaudentium constat, nec non et inopia frugum arefactis, molitur farina, spissaturque in panis usum.*”

Native of Barbary, about Algier, Belide, Mascar, Themsen, &c. and of Spain, if it be Clusius's tree.

QUERCUS GRAMUNTIA.

Q. Foliis subrotundo-ovatis, basi cordatis sinuato-denticulatis pungentibus undulatis subtus tomentosis, antheris subrotundis. Hortus Kewensis, v. 3. p. 355. Holly-leaved evergreen oak-tree.

Leaves roundish oval, at the base heart-shaped, sinuatedly denticulated, prickly, undulated or waved, underneath downy, with roundish antheræ or anthers.

Q. Gramuntia—foliis subrotundo-ovatis cordatis

datis subsessilibus, spinoso-dentatis undulatis subtus tomentosis. Willd. Sp. Pl. v. 4. 432.

ARBORETUM, HORTUS GLASNEVINENSIS.

Folia brevissime petiolata fere sessilia, coriacea, subtus levissime tomentosa, facies Ilicis aquifolii rigida, basi cordata. Synonymum Magnoli a Linnæo indicatum ad varietatem *Q. Ilicis* spectat. Willdenow, l. c.

It is considered as hardly a distinct species from the common evergreen oak. Native of the South of France. Hort. Kew. l. c.

QUERCUS ILEX.

Evergreen, or Holm Oak-tree.

Q. Foliis ovato-oblongis indivisis serratisque subtus incanis, cortice integra, nuce ovata. Willden. Sp. v. 4. 433. *Ilex coccigera*, Blackwel. t. 186. Duhamel. Arb. v. 1. p. 314. t. 123. Tabernamont, 968.

ARBORETUM, HORTUS GLASNEVINENSIS.

Leaves oblong-oval, undivided and sawed, underneath hoary, bark entire, with an oval acorn.

Variat foliis integerrimis, subserratis, et serratis, ovatis, ovato-oblongis, et ovato-lanceolatis, subtus fere glabris incanis et tomentosis. Willd. l. c.

Professor Martyn in his edition of Miller states, that of the *Ilex* or evergreen oak there are several

ral varieties, differing greatly in the size, and the shape of their leaves; but these arise from acorns of the same tree; nay the lower and upper branches have very frequently leaves very different in size and shape, those on the lower branches being much broader, rounder, and their edges indented and set with prickles; but these on the upper long, narrow, and entire. The leaves of the *Ilex* are from 3 to 4 inches long, and an inch broad near the base, gradually lessening to a point; they are of a lucid green on their upper side, but whitish and downy on their under; stand upon pretty long footstalks, and do not fall till they are thrust off by young leaves in the spring. The acorns are smaller than those of the common oak, but of the same shape."

"The wood, says Evelyn, is serviceable for stocks of stools, mallet-heads, mall-balls, chairs, axle-trees, wedges, beetles, pins, pallisadoes in fortifications; it supplies all Spain with the best and most lasting charcoal. Mr. Boutcher affirms that these trees soon make lofty and warm hedges, 40 or 50 feet high; but that they should not be planted near the house or in the gardens, because they make a great litter in April and May, when they cast their leaves."

Mr. Bradley says, that the *Ilex* produces admirable timber, particularly valuable for knee timber, being much tougher than the English oak; that many ships lading of it have been brought to England; that it is of quick growth,
that

that Robert Balle, Esq. raised some thousands of these trees from acorns at Mamhead in Devonshire, some of which in 30 years have grown to a considerable size, and that within the compass of six years many millions of them have been raised in England from acorns brought from Italy and Virginia, as well as great numbers of cork-trees." The latter were killed by the frost; but what is become of the millions of *Ilexes*?"

Native of the South of Europe, and Northern Africa.

QUERCUS SUBER.

Cork Barked Oak, or Cork-tree.

Q. Foliis ovato-oblongis indivisis serratis subtus tomentosis; cortice rimoso fungoso. Willd. Sp. Pl. v. 4. 433. Duhamel. Arb. p. 202. t. 46. and 47. Blackwel. t. 193. Clusii Hist. 22. Lobel Ic. 2. p. 159. Dodon. Pemp. 830. Ic. Schaw. Specimen. N. 569. Regnault. Bot. Ic. Desfont. Atlant. v. 2. 348. Fusch. Hist. Ic. 229. Haller. Hist. Stirp. n. 1626.

ARBORETUM, HORTUS GLASNEVINENSIS.

Leaves oblong-oval, undivided, serrated or saw-ed, downy underneath; with the bark chapt and fungous.

Foliorum basis parum in petiolum attenuata, quod nunquam in præcedente. Willd. l. c.

Native of the South of Europe, &c. Northern Africa, particularly in Barbary where it abounds.

Professor

Professor Martyn observes, that there are two or three varieties of the cork-tree ; one with a broad leaf, a second with a narrow leaf, both evergreen, and one or two which cast their leaves in autumn ; but the broad-leaved evergreen is the most common. The leaves of this are entire, about two inches long, and an inch and a quarter broad, with a little down on their under sides, on very short footstalks ; these leaves continue green through the winter till the middle of May, when they generally fall off, before the new leaves come out ; so that the trees are almost bare for a short time. The acorns are very like those of the common oak."

The exterior bark is the cork, which is taken from the bark every 8 or 10 years ; but there is an exterior bark, which nourishes them, so that stripping of the outer bark is so far from injuring the trees, that it is necessary to continue them ; for when the bark is not taken off, they seldom last longer than 50 or 60 years in health : whereas trees, which are barked every 8 or 10 years, will live 150 years or more. The bark of a young tree is porous and good for little ; however it is necessary to take it off, when the trees are 12 or 15 years old, for without this the bark will never be good : after 8 or 10 years the bark will be fit to take off again ; but the second peeling is of little use : at the third peeling the bark will be in perfection, and will continue so for 150 years, for the best cork is taken from old trees. The
time

time for stripping the bark is in July, when the second sap flows plentifully: the operation is performed with an instrument like that, which is used for disbarking the oak."

Pliny says there were no cork-trees in France or Italy in his time. At present there are considerable woods of them in the south of France, between Rome and Naples, between Pisa and Leghorn, where all the underwood is myrtle, &c.

It would be unnecessary here to enter into the uses of cork, as being sufficiently known, for its resisting both air and water.

QUERCUS COCCIFERA.

Kermes Oak-tree.

Q. Foliis oblongis indivisis spinoso-dentatis basi cordatis utrinque glabris, squamis calycis fructus patulis. Willd. v. 4. 433. Garidel. Aix. 245. t. 53. Russel. Aleppo. t. 15. f. 2. Schaw. Specimen. n. 351. Duham. Arb. 2. p. 314. t. 125. Clusii Hist. 24. Ic. Tabernamont. Ic. 969. Lobel. Ic. 2. p. 153, *Coccus infectoria*.

ARBORETUM, HORTUS GLASNEVINENSIS.

Leaves oblong, undivided, spinously dentated, cordate at their base, smooth on both sides, with the squamæ or scales of the calyx of the acorn spreading.

Variat valde magnitudine foliorum, quæ quadrilinearibus

drilinearis et sesquipollicaris occurrunt. Willdenow, l. c.

Native of Narbonne, Spain, Italy, Sicily, Istria, the East, and Judæa.

“ The Kermes oak is of small growth, seldom rising above 12 or 14 feet high (about 2 feet, *Villars*) sending out branches the whole length on every side, so as to form a bushy shrub. Leaves armed with prickles like those of the Holly. Acorns smaller than those of the common oak.”

“ The leaves resemble those of the *Ilex*, but they are less, thinner, and green on both sides.” *Villars*.

The Kermes or Scarlet grain, a little red gall, is collected from this species of oak, for the purpose of dyeing. Desfontaines relates that, although this tree abounds in Barbary, and bears a great quantity of the *Coccus Ilicis*, the insect whose puncture occasions the gall, yet it is totally neglected by the inhabitants, and the drug purchased at a high price from the French merchants for dyeing woollen red.

The Rev. Mr. Townsend's Travels in Spain, v. 3. 202, give a very full and interesting account of this oak, which the Spaniards call Cuscoja, and it grows from 12 inches to 2 feet high about Alicant. He observes that the *Grana Kermes* appear on the stems or small branches, some near the bottom, but mostly on the upper branches, yet always protected by the leaves and fixed to the

the stem by a glue, resembling thin white leather, spread over the stem, and covering, like the cup of the acorn, a segment of the grana. The agglutinating coat may be traced through a small hole into the grana, from whence it proceeds, &c. here it spreads like the placenta on the internal surface.

The grana are of various sizes from one-eighth to one-fourth of an inch in diameter, perfectly spherical, and covered with a white powder, which being rubbed off, the surface appears red, smooth, and polished. On the same stem the grana may be seen in several stages—as in tough membranes filled with a red juice resembling blood, but on paper leaving a stain as bright and as beautiful as the best carmine. In the second stage, under the first coat or pellicle is a thin tough membrane enclosing the eggs, now most minute, and scarcely to be distinguished without the assistance of a glass. Between this membrane and the pellicle is the same red liquor, but less in quantity. This pellicle is evidently separated from the inner membranes, by what seems to be the viscera and blood vessels, but near the hole these two coats adhere closely together.

The interior membrane is thin, white, and tough, with a lunar septem, forming the ovary, which at first is very small, and scarcely discernible, but progressively enlarges, till in the third stage it occupies the whole space, when the tincturing juice disappears, and only eggs are to be seen,

seen, to the numbers of 1500 or 2000. It is clear that the grana derive no kind of nourishment from the plant, on which it is fixed; and from its position it seems that the little animal chooses the *Quercus coccifera*, which in its prickly state resembles the holly, only for the sake of shelter and protection from birds.

Besides the Kermes, there are many large red excrescences on this species of oak, some formed on the leaf, others on the peduncle of the amennaceous flowers. These morbid tumors have many perforations, communicating with little cells, which contain each a small white grub. The cell is formed by a strong membrane, but the substance of the tumor is spongy."

QUERCUS PSEUDO-COCCIFERA.

Desfontaines.

Q. Foliis oblongis spinoso-dentatis utrinque glabris, squamis calycis fructus rigidis patentibus. Willdenow, v. 4. 434.

ARBORETUM, HORTUS GLASNEVINENSIS.

Q. Foliis perennantibus glabris, oblongis rigidis brevissime petiolatis, margine serrato-spinosis, calycibus echinatis. Desfont. Fl. Atlan. v. 2. p. 349.

Leaves perennial, ovate, smooth, rigid, on very short footstalks, serrated and spinous on the margin, with an echinated calyx.

Desfontaines

Desfontaines l. c. further describes this species of oak, as a tree of 7 or 8 feet high—the leaves ovate or elliptical, shining, rigid, smooth, with very short leafstalks, slightly serrated on their margin, and the serratures spinulous, fruit sessile or on short peduncles. Calyx furnished with rigid scales, whose tips are lax or echinated. Acorn ovate and ending in a point.

Native of Algiers and Mount Atlas.

QUERCUS ESCULUS.

Italian, or small prickly cupped Oak-tree.

Q. Foliis ovato-oblongis sinuatis glabris lobis oblongis obtusis subangulatis, basi attenuatis, junioribus utrinque hirtis. Willd. v. 4. 449.

Leaves oblong oval, sinuated and smooth, the lobes oblong, obtuse, somewhat angled, thinned at their base, in their younger state hairy on both sides.

Folia pinnato-partita fere ad costam marginatam : laciniis remotis, lanceolatis, acutis, postice inprimis angulatis ; subtus etiam nuda.

Fructus mihi ignotus. Willdenow, l. c.

Native of the south of Europe.

ARBORETUM, HORTUS GLASNEVINENSIS.

“ The leaves of the Italian oak are smooth and deeply sinuated ; some of the sinuses are obtuse, and others end in acute points : they are on very short footstalks : the branches are covered
with

with a purplish bark when young: the acorns are long and slender: the cups rough and a little prickly, sitting close to the branches. The acorns are sweet and frequently eaten by the poor in the south of France: in times of scarcity they grind them and make bread with the flour." *Martyn's Miller's Dictionary.*

QUERCUS ROBUR. *Willdenow.*

Sessile fruited Oak.

Q. Foliis oblongis petiolatis glabris sinuatis, lobis rotundatis, fructibus oblongis sessilibus. Willdenow, v. 4. 450.

Q. (*sessiliflora*) foliis petiolatis deciduis oblongis, sinubus acutioribus oppositis, fructibus sessilibus. Smith. Fl. Brit. v. 3. p. 1026, 1027. Eng. Bot. v. 26, 1845. Martin. Fl. Rust. t. 11. var. *sessilis*. Bauhin. Hist. 1. 70. t. 1.

Leaves with footstalks, deciduous, oblong, sinuses acute and opposite; with *sessile* fruit, or without a peduncle or fruitstalk.

Doctor Smith, English Botany, l. c. observes that this is fortunately much less common than the *true British oak*, which I shall next consider, as its timber is far less strong and durable, but however found in most parts of England. It is known by its leaves being more regularly and oppositely sinuated, which gives the tree a neater and more chesnut-like aspect, with generally longer footstalks; but especially by the female flowers

flowers, and consequently the acorns, being sessile. It is said to be somewhat later in flowering, and the leaves are commonly more permanent. Sometimes they are downy underneath, as in specimens sent by Mr. W. Berrer, and Mr. Lynell from Sussex, which variety is called the Durmast oak. This abounds in the New Forest, and above Goodwood, near Chichester; but however desirable in home plantations, it is to be rejected from all plantations for valuable purposes, and the *true* *Q. Robur* should be carefully preferred. Professor Martyn, whose *Flora Rustica* contains a full account of these trees, has only erred in considering the common smooth-leaved state of *Q. sessiliflora* as belonging to the *Robur*, misled, as it seems, by the occasional footstalks of the leaves.

QUERCUS PEDUNCULATA. Willdenow.

Common British Oak.

Q. Foliis oblongis subsessilibus glabris sinuatis, lobis rotundatis, fructibus oblongis pedunculatis. Willd. Sp. Pl. v. 4. 450.

Q. (Robur) foliis deciduis oblongis superné latioribus; sinubus acutioribus: angulis obtusis, pedunculis fructiferis elongatis. Fl. Brit. Smith, v. 3. p. 1026. Eng. Bot. v. 19. t. 1342. Woodvill. Med. Bot. ed. alt. v. 1. p. 23. t. 10.

Martin. Fl. Rust. t. 10. *var. pedunculatis.* Fl.

g

Danica

Danica t. 1180. Duhamel. Arb. v. 2. t. 47, Hunt. Evel. Sylv. tab. ad. p. 69.

ARBORETUM, HORTUS GLASNEVINENSIS.

Leaves deciduous, oblong, broad at the top; sinuses or indentures acute; angles obtuse, with elongated fructiferous peduncles or fruitstalks.

Doctor Smith observes that the wood of this species is of more consequence and bears a higher price than the former, the wood being highly useful, hard, and tough. In the former the leaves are furnished with footstalks, and more regularly and equally pinnated or winged—in this species they are alternate, rather sessile, oblong oval, sinuated, with the lobes obtuse; on their upper side smooth and shining; on their under pale and somewhat of a glaucous or sea-green colour.

And again in Eng. Bot. l. c. he observes that this is the most common, growing every where in woods and hedges, and its timber is also the best—growing to a large size, rich and picturesque in form of foliage—flowers early in April—the leaves are deciduous, alternate, nearly sessile, somewhat obovate, but deeply sinuated, with obtuse lobes; smooth and shining above, a little glaucous beneath. Male flowers in slender pendulous stalked yellow clusters—female 3 or 4 on a long stalk—the calyx of the latter is entire, scaly, and becomes the well known cup of the nut or acorn. Few plants nourish more insects.

Mr.

Mr. Miller seems to think that this species is not so common as the former, his *Q. Robur*, but in the wilds of Kent and Sussex there are many large trees of it; he observes that the leaves in this species are not so deeply sinuated, nor are they so irregular, but the indentures are opposite; they have scarce any footstalks, but sit close to the branches; but the acorns stand upon very long footstalks. The timber of this is accounted the best, and the trees when growing have a better appearance.

Professor Martyn observes, that Miller is mistaken in affirming that the tree, which bears sessile acorns, is the most common oak of England, and in referring us only to the wilds of Kent and Sussex for the other. This mistake has been copied by Dr. Hunter in his edition of Evelyn's *Sylva*."

Du Roi affirms that the timber of the stalk-fruited oak is whitish and hard; whereas that of the other is reddish and brittle. If this should turn out to be the case, it behoves planters of oak for timber to attend to the distinctions given, and to avoid gathering acorns for planting from such trees as have the leaves or footstalks with sessile fruits. *Martyn's Fl. Rustica*, 10.

The wood of this oak, when of a good sort, is well known to be hard, tough, and tolerably flexible, not easily splintering, strong without being too heavy, and not easily admitting water; for these excellent qualities it is preferred before

all other timber for ship-building. It is also adapted to almost every purpose of the carpenter; indeed it would be difficult to enumerate all the uses, to which it may be applied. There is a kind of it, says Evelyn, so tough and compact, that our sharpest tools will hardly enter it. Though some trees be harder, yet we find them more fragile, and not so well qualified to support great weights, nor is there any timber more lasting, which way soever used.

QUERCUS PUBESCENS. Willd.

Q. Foliis oblongis-ovatis petiolatis sinuatis subtus pubescentibus, lobis obtusis angulatis, basi subcordatis. Willd. Sp. Pl. v. 4. 451. Secon-dat. Mem. du Chêne, p. 3. t. 5, Chêne noir.

QUERCUS SESSILIFLORA, var. β . Smith
Fl. Brit. 3. 1027.

ARBORETUM, HORTUS GLASNEVINENSIS?

Durmast Oak. Mart. Fl. Rust. v. 1. t. 12.

In the New Forest, England. Martyn.

Leaves oblong-oval with footstalks, sinuated, pubescent underneath, lobes obtuse and angled, at their base somewhat heart-shaped.

Species distinctissima, similis Q. Robori sed abunde diversa; *statura* minori, *foliis* minoribus subtus pubescentibus, vernantibus albido-lanuginosis, basi subcordatis, *fructibus* minoribus.

Q. pubescens

Q. pubescens in meo arboreto Beroliniensi 279. descripta est *Q. albæ* varietas, folia majora basi attenuata habet. Willden. l. c.

This is a very distinct species, though like the *Q. Robur*, but differing in many respects, it is not near so tall, the leaves small, and their under sides pubescent, when flourishing covered with a woolly whiteness, somewhat heart-shaped at their base, and the fruit smaller. *Q. pubescens* described in Willdenow's Berlin Arboretum, p. 279, is a variety of the *Q. alba*, which has larger leaves attenuated or thinned at their base.

Native of England, France, Austria, Hungary, and Turin.

QUERCUS DENTATA. Thunberg.

Q. Foliis ovato-oblongis obtusis inciso-dentatis subtus tomentosis. Willd. Sp. Pl. v. 4. 452.

Leaves oblong-oval, obtuse, tooth-cuted, underneath downy.

Caulis arboreus. *Rami et ramuli* crasse sulcati, punctis nodulisque muricati, summi tomentosi erecti. *Folia* in apicibus aggregata brevissime petiolata obovato-oblong obtusa inciso-dentata inermia parallelo-venosa, supra villosa, subtus tomentosa mollia bipollicaria. Thunberg Fl. Japan, 177.

ARBORETUM, HORTUS GLASNEVINENSIS?

Small and large branches thick, sulcated or grooved, muricated or prickled with little dots
and

and knobs, the upper ones downy and erect. Leaves aggregated or in clusters at the ends of the small branches, on very short footstalks, of an inversely oblong-oval shape, obtuse, tooth-cuted, unarmed or without spines, with parallel nerves, villous on their upper, downy on their under sides, soft, and two inches long.

Native of Japan.

QUERCUS TOURNEFORTII. Willdenow.

Q. Foliis oblongis pinnatifido-sinuatis subtus tomentosis basi rotundatis, lobis lanceolatis acutiusculis integerrimis distantibus, calycibus fructus hemisphæricis echinatis pubescentibus. Willdenow, 4. 453.

ARBORETUM, HORTUS GLASNEVINENSIS?

Leaves oblong, pinnatifidly or wingedly sinuated, downy underneath, rounded off at their base, lobes lanceolated somewhat acute, distant and very entire; the cup of the acorn hemispherical echinated and pubescent.

Differt abunde a Q. cerri FOLIIS profunde pinnatifidis, lobis distantibus, integerrimis, subtus albo-tomentosis, FRUCTU majori. Willdenow, l. c.

Differs very much from the Q. cerris in the leaves been deeply winged, the distant and very entire

entire lobes, covered with a downy whiteness, and the acorn being larger.

Native of Armenia.

QUERCUS CERRIS.

Turkey Oak.

Q. Foliis oblongis pinnatifido-sinuatis subtus hirtis, basi angustatis, lobis oblongo-lanceolatis dentatis, calycibus fructibus hemisphæricis echinatis. Willd. Sp. Pl. 4. 454. Du Roi Harbk. 2. p. 259. t. 5. f. 1. Willd. Arb. 280.

ARBORETUM, HORTUS GLASNEVINENSIS.

Leaves oblong-oval, pinnatifidly sinuated, hairy underneath, narrowed at their base, lobes oblongly lance-shaped, dentated, with the cups of the acorn hemispherical and echinated.

Many linear ramenta from the axilla of the leaves.

Leaves oblong and pointed, and frequently lyrate; jagged and acute pointed, a little hoary on their under side, and stand on slender footstalks. The acorns are small, and have rough prickly cups. *Martyn's Miller.*

Aiton's *Hortus Kewensis*, v. 3. 359. takes notice of some varieties. The *Lucombe* or Devonshire oak is supposed to be one, see 62d vol. of Philosophical Transactions.

Mr.

“ Mr. Gilpin, *Forest Scenery*, v. 1. 97. says, it is nearly an evergreen, named from the person who raised it, produced from an acorn of the common Turkey oak, from which all have been grafted. It is said the growth is rapid; but from few trees, and those but young, no judgment can be well formed.”

Native of Spain and France.

QUERCUS AUSTRIACA. Willdenow.

Q. Foliis oblongis levissime sinuatis subtus pubescentibus basi angustatis, lobis brevissimis obovatis acutiusculis integerrimis, calycibus fructus hemisphæricis echinatis. Willdenow. 4. 454. Clus. Hist. 1. p. 20. *Cerrus*.

ARBORETUM, HORTUS GLASNEVINENSIS.

Leaves oblong, very delicately sinuated, pubescent underneath, narrowed at their base; lobes very short inversely oval, somewhat acute and very entire, with the cups of the acorn hemispherical and echinated.

Forma foliorum fere ut in Q. Robore sed sublus pubescentia. Differt a præcedente qua cum fructu convenit: FOLIIS levissime sinuatis, lobis ovatis integerrimis totoque habitu, nec est varietas hujus. Willdenow, l. c.

Very like the *Q. Robur* in the form of its leaves, but in this species they are pubescent underneath. It differs from the *Q. Cerris*, with which it agrees
in

in the shape of its fruit, but the leaves are very slightly sinuated, the lobes oval and very entire throughout, neither is it a variety of this species.

Native of Austria, Hungary, and Carniola.

QUERCUS,

OR,

O A K S:

FROM

WILLDENOW.

† foliis integerrimis.
with very entire leaves.

SPECIES		NATIVE PLACES of GROWTH.
1	Quercus Phellos - -	North America.
2	— maritima - -	Maritime situations Carolina.
3	— sericea - -	Carolina and Georgia.
4	— myrtifolia -	Carolina.
5	— virens - -	Along the sea shore from Virginia to Florida.
6	— cinerea - -	Carolina and Georgia.
7	— microphylla -	On the mountains of Alcam- baro S. America.
8	— salicifolia -	In Mexico near Acapulco.
9	— glabra - -	Japan.
10	— concentrica -	High woods in Cochinchina.
11	— molucca - -	Molucca islands (Celebes and Formosa.
12	— laurifolia - -	South Carolina and Georgia.
13	— imbricaria -	Alleghany mountains N. Ame- rica.

14 Quercus

- 14 *Quercus elliptica* - - On the roads leading from Ixmiquilpan to Cinapan, and from Tixtala to the river Azul, Mexico.
- 15 ——— *acuta* - - Japan.
- 16 ——— *magnoliæfolia* In the same situation as the *Q. elliptica*.
- 17 ——— *lutea* - - Mexico.

†† *foliis dentatis*

dentated, or toothed leaves.

- 18 ——— *glauca* - - Japan.
- 19 ——— *cuspidata* - - Japan.
- 20 ——— *serrata* - - Fakonian mountains, Japan.
- 21 ——— *diversifolia* - - Near the villages of Chalm and Sancta Rosa America.
- 22 ——— *agrifolia* - - Eastern shores near Monterey and Nootka, N. America.
- 23 ——— *gramuntia* - - South of France?
- 24 ——— *Ballota* - - Barbary.
- 25 ——— *Ilex* - - South of Europe, and North Africa.
- 26 ——— *Suber* - - South of Europe and North of Africa.
- 27 ——— *coccifera* - - Narbonne, Spain, Italy, Sicily, Istria, the East, and Judæa.
- 28 ——— *Pseudo-coccifera* - - Algiers and Mount Atlas.
- 29 ——— *rigida* - - Sea shores Caramania.
- 30 ——— *rotundifolia* Spain.
- 31 ——— *humilis* - - Sandy and gravelly situations, Portugal.
- 32 ——— *Lusitanica* - - Portugal.
- 33 ——— *infectoria* - - In the East.
- 34 ——— *mucronata* S. America between Ixmiquilpan and Cinapan.

- | | | | |
|----|--------------------------|---|--|
| 35 | <i>Quercus tomentosa</i> | | On the road from Acapulco to Mexico, beyond the river Mescala. |
| 36 | ——— <i>circinata</i> | | S. America, between Tixtala and Chilpancingo. |
| 37 | ——— <i>splendens</i> | | Neighbourhood of Tixtala, S. America. |
| 38 | ——— <i>rugosa</i> | - | Woods of Huisquiluca and Ocuila, on the road from Mexico to Santo Christo de Chalma. |
| 39 | ——— <i>macrophylla</i> | | Chilpancingo, la Curva, and mountains Quirapu, S. America. |
| 40 | ——— <i>Prinus</i> | - | Pensylvania, Virginia, Carolina, Florida, in shady wet situations. |
| 41 | ——— <i>Prinoides</i> | | Pensylvania, Virginia, Carolina. |
| 42 | ——— <i>montana</i> | - | On the high mountains Virginia and Carolina. |
| 43 | ——— <i>bicolor</i> | - | In flat situations Pensylvania, Virginia, and Carolina. |
| 44 | ——— <i>Castanea</i> | | Allegany mountains |

††† foliis apice lobatis.

leaves lobed at their apex.

- | | | | |
|----|---------------------|-----|---|
| 45 | ——— <i>aquatica</i> | - | Wet situations from Mariland to Florida. |
| 46 | ——— <i>nigra</i> | - - | Pensylvania, Virginia, Carolina, and Florida. |
| 47 | ——— <i>triloba</i> | - | From New England to Georgia |
| 48 | ——— <i>nana</i> | - | Carolina. |

†††† foliis

†††† foliis sinuatis, lobis mucronatis.

leaves sinuated, with the lobes bristle-pointed.

- | | | | |
|----|----------------|---------------------|---|
| 49 | <i>Quercus</i> | <i>hemisphærica</i> | Georgia and Florida. |
| 50 | — | <i>elongata</i> | - Virginia, Carolina and Florida. |
| 51 | — | <i>tinctoria</i> | - Pennsylvania and the high mountains Carolina. |
| 52 | — | <i>discolor</i> | - Virginia, and Carolina. |
| 53 | — | <i>rubra</i> | - From Canada to Carolina. |
| 54 | — | <i>coccinea</i> | Virginia and Carolina. |
| 55 | — | <i>Catesbæi</i> | Maryland, Virginia, and Carolina. |
| 56 | — | <i>palustris</i> | - New England, Pennsylvania, and Virginia. |
| 57 | — | <i>acutifolia</i> | - On the road from Acapulco to Mexico. |
| 58 | — | <i>candicans</i> | In the sands near Tixtala, S. America. |
| 59 | — | <i>ilicifolia</i> | - Sandy places Nova Boraco and Nova Cæsaria N. America. |
| 60 | — | <i>Pseudo-suber</i> | Mountains in Spain, Barbary, and Tuscany. |
| 61 | — | <i>Ægilops</i> | - Spain, and in the East. |

††††† foliis sinuatis, lobis muticis.

sinuated leaves, without bristles on the lobes.

- | | | | |
|----|---|--------------------|--|
| 62 | — | <i>alba</i> | - - From Canada to Florida. |
| 63 | — | <i>Esculus</i> | - South of Europe. |
| 64 | — | <i>Robur</i> | - - Woods throughout Europe. |
| 65 | — | <i>pedunculata</i> | Woods throughout Europe. |
| 66 | — | <i>pubescens</i> | England, France, Austria, and Hungary. |
| 67 | — | <i>pyrenaica</i> | Pyrenees. |

68	<i>Quercus</i>	<i>faginea</i>	+ Spain and South of France.
69	—	<i>dentata</i>	- Japan.
70	—	<i>lobata</i>	- South America,
71	—	<i>stellata</i>	- Canada, New England, Pennsylvania, Carolina.
72	—	<i>lyrata</i>	- Banks of rivers, S. Carolina and Georgia.
73	—	<i>macrocarpa</i>	Allegany mountains, Kentucky and Tennessee.
74	—	<i>Tournefortii</i>	Armenia.
75	—	<i>Cerris</i>	- Spain and France.
76	—	<i>Austriaca</i>	Austria, Pannonia, and Carniola.

45

Amphibian 3

OBSERVATIONS
ON THE
CULTIVATION AND GROWTH
OF
OAK TIMBER.

*In a Letter from the Rev. Richard Yates, F. A. S. Chaplain
to his Majesty's Royal Hospital at Chelsea, to Charles
Taylor, Esq. Secretary to the Society of Arts.**

FROM NICHOLSON'S JOURNAL, VOL. VII.

S I R,

TO expatiate upon the vast importance of increasing the growth of oak timber, seems unnecessary. The national advantages, resulting from this source, appear to be in general well understood; and yet the cultivation and management of this most useful plant has not hitherto obtained that degree of attention, which it most certainly merits.

h

Entirely

* For which the silver medal was voted. Memoirs for 1802, page 80.

Entirely to obviate, or even in some measure to remove or lessen, the obstacles that still continue to impede the planting of oaks, would therefore be rendering an essential service to the nation. The desire of accomplishing so beneficial a purpose has induced the judicious and public-spirited conductors of the Society of arts to propose a premium for "ascertaining the best method of raising oaks:" in consequence of which, this paper is submitted to their candid consideration. And as the statements here made are founded upon a sedulous and active experience of fifty years, it is presumed the *spirit* and *meaning* of the Society's proposal may have been observed, although it has not been possible (in this instance) *literally* to fulfil its terms; at least, the very intention of promoting and forwarding the views of so enlightened and highly useful a society may, it is hoped, be accepted as an apology for calling their attention to these observations.

It forms no part of the present design to enter minutely into the various causes, that continue to operate in obstructing the cultivation of oak; as there is one of peculiar magnitude, the consequences of which are highly detrimental and injurious, and which it is therefore the principal object of this paper to remove.

An

An opinion is generally prevalent, that the oak is particularly slow in its growth, and requires a great number of years before it affords any advantage. This idea too often deters from planting, on account of the very great length of time it is supposed the land must be occupied, before any return of valuable produce can be obtained from it, after a considerable expence may have been incurred in forming plantations.

This opinion I consider as entirely founded in error, and to have taken its rise in a great measure from the want of proper management, that has hitherto commonly prevailed in the raising of oaks: and in this paper I shall endeavour strongly to state, that the oak may be rendered very rapid in its growth, and that consequently land may be employed to great advantage in its cultivation, as a very considerable and profitable produce may, in a much shorter time than is generally supposed, be derived from proper parts of an estate thus employed.

Oak timber in this country, for the most part, appears in trees of a considerable extent of head, but seldom more than 20 or 30 feet in stem; and this, in many instances, the growth of a century. Now, by the course of management here proposed, it is conceived that trees, of at least *double this magnitude*, may be obtained in about half that time.

It is not my intention to attempt a proof of this proposition by theoretical deductions, but to appeal for its confirmation to the indubitable test of fact, which, from the event of repeated trials, impresses a conviction, that experience will be found to support and establish it in the most unequivocal manner.

It would be easy to enlarge much on the various qualities of soil, the nature and process of vegetation, and the peculiar properties of the oak ; but as these topics may be found amply and judiciously discussed in many other authors, who have expressly treated on these subjects, I shall decline all such speculations ; and, with the hope of being more essentially useful, shall confine myself to a statement as simple and practical as possible.

The oak, in the progress of its growth, spreads numerous roots near the surface of the ground, and in an horizontal direction ; these assist in supporting and preserving the tree in its position, but seem to contribute very little to its increase and magnitude. The oak appears to derive its chief nutriment and strength from a root, that always descends at right angles to the horizon, and is called the tap-root. The first thing, therefore, to be observed is, that upon a judicious attention to this peculiarity the planter's success principally depends ; and the neglect of
this

this care is the constant source of error and disappointment. In all climates, and upon all soils, to preserve this tap-root from injury, and as much as possible to assist its growth, is a general, and indeed the most essential principle in the cultivation of oak. With a due regard to this circumstance, the management of a plantation may be resolved into the three following practical directions :

Previously to planting the acorns, *loosen* the earth intended for their reception, by *deep trenching*.

Never transplant, or in any way disturb, the saplings intended for timber.

Keep the plant carefully *pruned*, till arrived at a proper height.

More fully to elucidate the subject, and to prevent the possibility of misapprehension, it may be proper to give a more detailed statement.

In determining on a spot to form a plantation of oaks for timber, it must always be recollected that the plants are to remain without removal in their first situation; the clearing and fencing may then be attended to as usual; and in the course of the winter, from September to March, the particular spots, intended for the reception of acorns, may be prepared for that purpose, by digging a trench about three feet in width, and from three to six feet in depth, according to the closeness

closeness and tenacity of the soil. If grass-ground, the first spit should be placed at the bottom of the trench; and if more than one trench be necessary, they should be prepared in the same manner, preserving a distance of ten yards between each, if it be intended to employ the intermediate space in underwood, or for any other purpose.

Having made a careful selection of acorns, that are perfectly sound, and in good preservation, they are to be planted about the middle of March. Draw a drill in the centre of the trench, two inches in depth, if the soil be heavy and loamy; but three inches in a light and sandy earth. In this place the acorns two inches asunder, and cover them carefully with mould. When the plants appear, they must be weeded by hand in the rows, and the earth of the trench round them cleaned with a hoe, once a month during the summer. In October inspect the rows, and thin them by pulling up every other plant; attention will of course be paid to remove the weak and crooked plants, and leave those that are tallest and straightest. On the second year, the operation of thinning must be repeated, at the same time, and in the same manner; and, should any of the remaining plants have made side shoots stronger than the general character, they must be smoothly cut off with a sharp knife, close to the leading stem

stem. On the third year, the thinning is again to be repeated, and the general pruning commenced, by cutting off close to the leading stem all the side shoots of the first year; thus leaving the branches of two years to form the head of the following year. The removal of every alternate plant must be continued yearly, till the trees are about 30 feet apart, at which distance they may remain for timber. The pruning is to be continued, by removing every year, very smooth and close to the main stem, one year's growth of side branches, till the plants are arrived at a stem of 40, 50, or 60 feet, and they may then be permitted to run to head without further pruning.

The particular arrangement, here recommended, may be varied according to any peculiarities of situation, regard being constantly had to the general and most important principle of loosening the ground *very deep* previously to planting the acorns. By this mode of culture, oaks may be raised in almost any soil; but, where it is possible, a loam or marl is always to be chosen. Oaks thrive much the best in such earth; and when assisted by *deep trenching* and *judicious pruning*, attain in a few years to an immense size.

Those, who have been accustomed to notice the slow growth, and stunted appearance of oak trees, when denied the assistance of art, and left to themselves in the common way, would observe

serve with astonishment the vigorous and rapid increase of plants under the management now pointed out.

The plants thinned out the first three or four years, though not fit to be depended upon for timber, as transplanting generally injures very materially the future growth, may be replanted in the intermediate spaces between the rows, for the purpose of being afterwards removed; or they may be usefully placed in hedges, or other spare and unoccupied spots of ground. They should be headed down at the time of transplanting, as this operation assists the process of nature, in reproducing or remedying any injury the tap-root may have received from the removal; and, if proper attention be given to loosening the soil for their reception, and pruning them as they advance, in most instances an adequate profit will be derived from the labour bestowed upon them. After a few years, the produce of the timber plantation will be found very advantageous. The young trees, that are to be removed yearly, will always find a ready market for a variety of purposes, unnecessary here to enumerate. In addition to these advantages, if by this treatment of *deep trenching* previous to planting, and *annual careful pruning* during the growth, timber can be produced in about 50 years, of equal quality, and much superior in size, to that, which has been above 100 years growing under improper management

nagement, or without the assistance of cultivation; it will doubtless be allowed, that a most beneficial, if not absolutely the best possible method of "raising oaks," is here pointed out and ascertained.

This method of cultivation may perhaps be thought to occasion so much expense in manual labour, as to prevent its being generally adopted; it might perhaps be sufficient to observe that, if the work be conducted with judgment and economy, the future produce would afford ample returns for all necessary expenditure; it should also be recollected, that the previous preparation of the ground, and the subsequent pruning of the plants, are both to be performed at that season of the year when a scarcity of work will enable the planter to obtain assistance upon easier terms; with this additional advantage also, of providing employment for the labourer at those times, when the general state of agricultural business renders it difficult for him to find maintenance for himself and family without charitable relief.

In 1750, at Ingestrie, in Staffordshire, the seat of Lord Chetwynd, some plantations were formed and managed in a great measure according to the principles here stated, and the growth of the plants was so uncommonly rapid, and so extraordinary, that it could not but attract the

notice of all concerned in the conduct of them. The attention to the subject, then excited, has been the occasion and ground of all the observations and experiments made from that time to the present, the result of which is given in this paper.

The extensive plantations of the late Lord Denbigh, at Newnham Paddox, in Warwickshire, are well known and much admired. The whole has been conducted with great judgment. About a square acre has been employed in raising oaks upon a plan nearly similar to that now proposed, and affords the best and most convincing proof of the superior utility and efficacy of such management. Had the noble Earl been now living, I should have been enabled to have laid before the Society some more detailed particulars; that, however, is now impossible; this paper, therefore, in its present state may, perhaps, be thought not altogether unworthy of notice, as tending to forward the liberal designs of the Society, and contributing to the advantage of the public, the author conceiving that the best method of raising oaks is ascertained and stated in it.

Should the Society be in any degree inclined to join in this sentiment, it may perhaps induce them to make some alteration in the terms of their proposal; as, according to the statements
made

made in this paper, and indeed from what may be seen in every part of the kingdom, in the character and appearance of oaks growing without cultivation, it seems ascertained, that "acorns
" set with the spade or dibble, without digging
" or tillage," can never be depended on to form good timber; and even in the most favourable circumstances of this case, the growth will be exceedingly slow and precarious. The same may be said of "young plants, previously raised in
" nurseries, and transplanted;" for if the tap-root be cut, broken, or in any degree injured, which in transplanting it is almost impossible to avoid, that plant will seldom become a vigorous and flourishing tree. To form a course of experiments on such a plant as the oak, is not a very easy matter. To fulfil explicitly the conditions of the Society would require a great length of time, and would be attended with considerable expense, from which future candidates may in a great measure be exonerated. The raising even one acre in the manner here ascertained might be productive of great pecuniary advantage, if the facts and experience, detailed in this paper, are permitted to prove the inutility of the other two methods, and consequently to remove the necessity of employing so much ground upon them, at an expense they will never repay.

Chelsea College, Nov. 4, 1801.



OBSERVATIONS
ON THE
SOWING OF SPRING WHEAT.

IN the year 1805, there were 49 candidates, who received premiums for sowing spring wheat.

In the year 1806, there were 33.

From observations on the whole, the Dublin Society find great reason to recommend the practice.

*Claim and Report of Gerald Bellew, Esq.
County of Louth.*

AFFIDAVIT OF SURVEYOR.

I hereby certify upon oath, that I have surveyed two divisions of wheat stubble fields, belonging to Gerald Bellew, Esq. of Drummin-castle, in the county of Louth, barony of Ferrard, and parish of Dyfart, and that the said divisions, to the best of my skill and knowledge, measure or contain eleven acres, two roods, and eleven perches, plantation measure.

JOHN JORDAN.

B

Report

Report relative to the sowing of eleven acres, two roods, and eleven perches of land with wheat, in the spring of the year 1806.

On the 12th day of February, 1806, my men began the sowing of said eleven acres, two roods, eleven perches, with red lammas-wheat, having been first properly steeped; the soil a sound gravelly loam, fallowed the preceding summer in the usual manner practised; and finished the sowing, ploughing in, &c. of said eleven acres, two roods, eleven perches, on the 19th of March, 1806.

After the 19th of March, and before the 1st of April, 1806, I had three acres and a half more sown with wheat, being the remainder of the fallowed land; the weather being frequently wet in February and March caused many stops, and prevented my getting more than the said eleven acres, two roods, eleven perches, sown before the 20th of March.

The wheat grew up and looked very well until the middle of June, when it appeared to be at a stand for want of rain; May, June, and part of July being very dry, prevented the branching necessary to produce a large crop.

Commenced reaping before the middle of September, and got all up in good order, the season being favourable. On the 15th of October began drawing the crop to my hay-yard.

The

The produce of the eleven acres, two roods, eleven perches, was ascertained by the surest method, that of taking the tenth sheaf of each stack, by which the entire proves to be thirty-six barrels, five stones. Though the produce is small, the corn is bright-coloured and good; my bailiff or overseer was offered 43s. per barrel last Saturday, in the market of Drogheda, for a parcel of it; the highest price stated in the market note is 43s. but I understand higher prices were given, though not returned to the clerk of the market.

I do not recollect having seen one ear of blight in the entire crop, the preservation of which, through the assistance of God, I attribute to my manner of steeping the wheat, an account of which I fully described in last year's report. Many fields sown in autumn and winter were blighted; many also suffered by the blast, particularly the trenched wheat; my crop escaped very well, the straw being only lightly speckled towards the bottom.

Sworn before me, this 29th day
of January, 1807,

EDWARD BELLEW.

GERALD BELLEW.

*Barneath, the residence of
Sir Edward Bellew, Bart.*

On sowing Wheat in Spring.

I find from experience, that the best soil for sowing on in spring is a gravelly loam of good depth. To have a large crop, it must be rich and well fallowed in summer, the seed steeped in the manner stated in my report of last year, and *ploughed in* with a *narrow plough*. There will be no danger of smothering seed in this way, when the land has been well tilled, and will be sheltered both from frosts and heats.

The wheats, which are harrowed in, and trenched, very commonly produce a lank, thin grain, and are very subject to blights and blasts, and in wet weather to lodge or fall down.

I prefer the early red lammas wheat to any other; it is hardy and comes in early.

The members of the Dublin Society, by their premiums, have ascertained the facts they wished to be informed of, namely, whether wheat can be sown to advantage in spring.—That it can there remains no doubt, in a rich soil managed as I have mentioned.

My wheat is esteemed very good, yet the soil, on which it grew, was not in rich condition; had the summer been moist, the crop would have been nearly as good, as if the seed had been sown in winter. The greater part of wheat-sowing
is

is performed in winter, from the first of November to January ; we have often had such wet weather during these months, that it would be foolish to hazard sowing. We cannot do without wheat, now we can never want a sufficiency ; if the winter is too wet, the spring will answer to sow enough ; experience has proved the fact, which is of the highest consequence, that wheat can be sown with effect and advantage in spring, for the certainty and benefit of which the people of Ireland are indebted to the laudable exertions of the Dublin Society.

GERALD BELLEW.

*Drummin Castle,
29th January, 1807.*

A LETTER FROM JOHN RUXTON, ESQ.

SIR,

THE first Thursday in February being the day appointed by the Dublin Society for receiving claims to premiums for spring wheat, conformably to the directions of that honourable Society, I here enclose an exact statement of an experiment I made, in the year 1806, on a few acres of ground.

I am, Sir, your humble Servant, &c.

JOHN RUXTON.

*Black Castle, near Navan,
Feb. 4th, 1807.*

In

In spring, 1806, on reading an advertisement in one of the public papers, offering certain premiums for sowing spring wheat in that year, I immediately began to prepare two small fields for the experiment, one of them containing two acres, one rood, and twenty-four perches, and the other one acre, one rood, and nineteen perches, plantation measure. Both of them had been well manured in the year 1805, with a compost of earth mixed with lime, coal ashes, sweeping of roads, &c. which had lain a considerable time in a heap in my dung-yard, and had occasionally been turned over. Both fields were then sown with potatoes, one in drills, the other in the lazy-bed way, kept very clean, each producing a good crop. The ground after this, being in high condition, lay over until the beginning of March, 1806, without any other stirring, except what was occasioned by digging out the potatoes, so that after one ploughing I harrowed in two barrels of red lammas in the proportion of eleven stone three pounds to the acre, forming one field into ridges of eight or ten fods in breadth, and harrowing down the other in the broadcast way without shovelling. I had the two fields sown and finished on the 19th of March.

The wheat in both fields came up with the strongest marks of health and vigour, and continued until the beginning of July to promise an excellent

cellent crop, blossoming well. On my return from an excursion to the North, I perceived that the straw in several fields in the low grounds in my neighbourhood had acquired a darkish tinge, whilst the stems on the hilly and higher grounds were of a bright yellow. From that time my wheat began to show evident signs of blight, mildew, or injury of some sort or other; for on reaping it I found, that the ears had not properly filled, though the crop, in respect to quantity of straw, was abundant, the grain being small, yet sound. I used part of it myself for seed, and sold the remainder, at thirty shillings per barrel, to other farmers for the same purpose. This seed has succeeded every where, and now looks extremely well. I had from these three acres, three roods, and three perches, twenty-three barrels and nine stones of corn, or six barrels, four stones, and two pounds per acre.

To account for the partial failure of this crop, I shall offer the following observation: this ground is a deep loam, mostly surrounded by high hedges and hedge-rows; though sand may be found in many parts of it at the depth of two feet, yet in sinking a little deeper we generally meet with water, as if springing from some understratum, which may in the heat of summer be exhaled by the sun in too great a proportion,
and

and cause too rapid an exertion of the vegetative powers of the corn, and induce a consumption similar to what occurs in the animal world, where nature is overstrained.

Before I conclude this subject, I wish to mention a circumstance that struck me, and which has, I find, made some impression on others. On the 23d of June, 1806, having walked out very early in the morning, I perceived the fields about my house covered with small circles of a filmy kind of vapour resembling gossamer webs, but which appeared to me to contain nothing but moisture of an unctuous nature, vanishing as soon as the rays of the sun began to act upon them. It instantly occurred to me, that this fog would probably injure the spring crops, and having mentioned my apprehensions to an experienced farmer my neighbour, he told me, that he had on that morning made the same remark, as he was riding very early to the fair of Drogheda. According to some modern theories, the effect of the fog might be explained by supposing, that it envelopes the tender stems of the corn, and, by stopping their pores, prevents their usual secretions. I shall leave more experienced naturalists to decide this point.

Having passed part of last summer in the vicinity of Rostrevor, I had there an opportunity of observing the culture of spring wheat to great advantage.

vantage. Between the shore of the bay of Carlingford, and the mountains of Rostrevor in the county of Down, as well as along the foot of the other Moran mountains, the farmers have been long in the practice of sowing spring wheat, which produces good crops of an excellent quality, the grain, as I have been assured, bearing the highest prices given in the markets of Newry or Dundalk. On this coast they manure chiefly with sea-wrack, spread fresh from the tide, in layers of about three inches thick, which they plough in as soon as possible, before it has time to ferment. On ridges thus prepared they plant their potatoes, which are generally succeeded by spring wheat, sown in February. They sometimes harrow in the seed even without ploughing it. The land on their coast is generally a light-coloured clay, with a mixture of gravel, and is peculiarly adapted to the culture of clover. There is no limestone or limestone-gravel in this district; some farmers there had tried winter wheat, but, not finding it to succeed better than that sown in spring, desisted.

On the whole it appears to me, that spring wheat, when sown on rising grounds not much sheltered, on a sharp dry soil, tolerably well prepared, and manured well, seldom fails of producing a good crop, but, if attempted in deep
moist

moist land, without a free circulation of air, that the farmer's profit must be always problematical.

I have the honour to be, Sir,

Your most obedient humble Servant,

JOHN RUXTON.

*Black Castle, near Navan,
Feb. 4th, 1807.*

Rev. Dr. LYSTER,
Secretary to the Dublin Society.

ON PICKLING SEED FOR SOWING SPRING WHEAT.

THE pickling of seed wheat is so great a preservative against smut, that I think it should be practised by every one, that sows wheat. I put a pound of vitriol to a barrel of salt water, in which I steep my seed wheat about twenty or twenty-four hours, then take out the wheat, and let it drain for a few hours. I then spread it on a floor, and dry it with cold slacked lime, and then sow it. This method I have practised these five years past, and never have a ball of smut, though my neighbours immediately joining me, who do not pickle their seed, have in general smutty wheat.

THOMAS KEHOE.

Wicklow, Nov. 14th, 1806.

Communications

*Communications to the Board of Agriculture,
on Spring Wheat.*

I.

BY THE RIGHT HON. SIR JOSEPH BANKS, BART.

REAL spring wheat, the *Triticum Æstivum*, or summer wheat of the botanists, is a grain too tender to bear the frosts of the winter, but as quick in progress, from its first shoot to ripeness, as barley, oats, or any other spring corn.

It is well known on all parts of the Continent, and much used in France, where it is called *Blé de Mars*, from the season in which it is usually sown; and in some provinces *Bleds Tre-mois*, from the time it takes between seed time and harvest: in Spain it is called *Trigo de Marzo*; in Portuguese, *Trigo Tremos*; and in German, *Sommer Waitzen*; all which names mark distinctly the difference between this and winter corn.

It does not appear from the older books on husbandry, that it was at any former period much cultivated in England; the more modern ones are in general silent on the subject of it; they mention, indeed, under the name of spring wheat, every kind of winter wheat, which will ripen when sown after turnips in February. This is probably the reason, why the real spring wheat has been so little known; agriculturists, in general, conceiving themselves to be actually in the habit of growing spring wheat, when in reality they
were

were substituting winter wheat in its place, have been little inclined to inquire into the properties of the real spring wheat, when they had an opportunity of so doing.

In the lower parts of Lincolnshire, where the land is most valuable, and consequently the most subject to mildew, spring wheat has been long known, and it is now cultivated to a great extent. Mr. Sers, of Gedney, near Spalding, has this year claimed a premium of the Board for the largest quantity of land sown with spring wheat, in 1805; his quantity is 241 acres, and there is no reason to suppose, that he added a single acre to his crop on account of the Board's offer. He is a man who, by his skill and talents in agriculture alone, has raised himself to opulence, and possesses a considerable landed estate, for which he is certainly in part indebted to the free culture of spring wheat during the last thirty years.

Mr. Sers sows spring wheat from the 25th of March till the first week in May; for a full crop he sows fourteen pecks on an acre, and expects to reap four quarters;* if he sows seeds under it, which is very generally practised, he sows nine pecks, and expects three quarters in return; he finds it thrive nearly equally well on his stiff and

* N. B. The English quarter, consisting of eight bushels, Winchester measure, is nearly equal to about thirty three stones, although sometimes more, sometimes less, according to the quality of the grain.

and his light land ; and has found it, by experience, to be exempt from the mildew or blight, and free from all damage of the grub or wire worm.

The farmers in South Holland, where Mr. Sers resides, uniformly declare that they have been many years ago compelled, by frequent attacks of the mildew or blight, to abandon almost entirely the sowing of winter wheat, and that they then substituted spring wheat in its place, and have used it ever since : they believe it to be wholly exempt from the mildew or blight. In the neighbourhood of Horncastle, where I live, the land is either light or sandy, or composed chiefly of Norfolk marle, called in that neighbourhood white clay. Such land, though tolerably productive of barley and feeds, is not to be compared with the rich and fertile tracts of South Holland ; and yet the culture of spring wheat has of late years increased, and is now increasing fast, because the millers begin to understand its nature, and cease to undervalue it as they did at first.

The grain of spring wheat is considerably smaller than that of winter wheat ; in colour it resembles red lammas so much, that it may be mixed with that grain, and this mixture will do no injury to the feller, as spring wheat weighs heavy ; nor to the buyer, as it yields better at the mill than from its appearance might be expected ; 60 lbs. a bushel is about its usual weight. Mr. Sers's of
this

this year weighed 61lbs. and he has sold some mixed with less than half of red lammas, at the usual market price of the winter wheat of the last harvest, though the winter wheat is better in quality this year, and the spring worse than usual.

In the countries best acquainted with its culture, spring wheat is preferred to all other corn for raising a crop of seeds. This is owing to the small quantity of leaf it bears, less perhaps than any other corn, and to the short duration of the leaf, which fades and falls down almost as soon as it has attained its full size.

In cases where red wheat has been damaged by the wire worm, a mischief which seems of late years to have increased in this island, spring wheat appears to hold out an easy and a simple remedy. In the first week of May the ravages of the worm have abated somewhat; if then the seed of spring wheat is at that time dibbled, or only raked with a garden rake into the naked spots left by the worm, though it will not attain the growth, at which the worm begins to prey upon it, till he has changed his state for that of a winged beetle, it will certainly be ripe as soon as the winter wheat, and may be threshed out and sold with it; or if it is preferred, may be reaped separately, as the appearance of the ears, which in the Lincolnshire sort have longer beards or awns than the rivet or cone wheat, will point it out to the reapers in such a manner

a manner, that no great error can happen in separating it from the lammas.

In years of scarcity this wheat offers a resource, which may occasionally be of the utmost importance to the community; of this the Board were very sensible last spring, when they offered premiums for the increase of its culture, which have had the effect of rendering it much more generally known than otherwise would have been the case. The price of wheat seldom advances much, even in very scarce years, till a considerable portion of the crop has been thrashed out, and the yield of it by this means actually ascertained; but this does not take place till the seed time of winter wheat is wholly over; no speculation, therefore, of sowing an increased quantity of that grain can be entered into during the first year of a scarcity; but before the end of April, the question of the average yield of the preceding crop will be generally known, and, when it is much below the usual proportion, there can be no doubt that a large quantity of spring wheat will be sown, if the seed can be easily procured.

It is rather melancholy to reflect, that the progress of agricultural improvement has in some instances advanced in the inverse ratio of the utility of the novelty recommended to the public. Tobacco and potatoes reached Europe at much the same period, the time when Virginia was settled
by

by Sir Walter Raleigh ; but an ineffectual firmaum was issued by the Great Mogul against the use of tobacco, long before potatoes were commonly cultivated in the gardens of England, and that nauseous weed reached the furthest extremities of the Chinese empire, in spite of the obstacles placed by the government of that country against the introduction of novelties of any kind, long before potatoes had occupied any extensive portion in the field cultivation of this island.

Lest the revival of the culture of spring wheat, even under the liberal protection it has received from the Board, may be retarded by this principle, which seems to be inherent in the nature of mankind, it may be advisable to state here, that in the neighbourhood of Boston and Spalding in Lincolnshire the cultivation of it is now fully established, and likely to continue ; from either of these places, therefore, the seed may at any future time, as well as at present, be obtained without difficulty ; and as there is a water communication between these towns, and as Boston is a sea-port, it may always be brought to London, or any other maritime part of England, at a small charge.

In times when dearth recurs, which will occasionally happen as long as the manufacturing interest insist on keeping the price of corn, in a plentiful harvest, below the actual cost of growing it

it, speculations on the sowing of spring wheat may be carried so far as to raise the price of seed, till a saving in it becomes a matter of political as well as of economical importance; an experiment is therefore added, to shew that spring wheat will succeed as well by dibbling as by broadcast, made in the spring, 1804.

Mr. Wm. Showler, an intelligent farmer at Revelby, in Lincolnshire, dibbled four pecks and a half of spring wheat on one acre and two roods of middling land, which had borne turnips the winter before, and had no extraordinary preparation for this crop; the rows were eight inches asunder; the holes four inches asunder and two inches deep: two grains were put into each hole.

The produce from the quantity of $4\frac{1}{2}$ pecks of seed was 7 quarters, or 4 quarters, 1 bushel, and 1 peck an acre; a fair crop, and as much at least as could have been expected from 18 or 21 bushels sown broadcast on the same land.

By a careful analysis in the wet way, conducted by Professor Davy, of the Royal Institution, the following results have been obtained from different kinds of wheat:

From 100 parts of best Sicilian wheat,	<i>gluten</i> 21	<i>starch</i> 75	<i>insoluble parts</i> 5
From do. spring wheat of 1804	— 24 —	— 70 —	— 6 —
From do. good English wheat of 1803	— 19 —	— 77 —	— 4 —
From do. blighted wheat of 1804	— 13 —	— 52 —	— 44 —

From this ingenious analysis we may fairly deduce, that bread made of the flour of spring wheat

wheat is more nutritious than that made of winter wheat, because spring wheat contains a larger proportion of the gluten or half animalised matter; and also that a miller ought not to deduct from the price of spring wheat more than 2 per cent. on the money price of winter wheat of the same weight, as the excess of the weight of insoluble matter, or bran, is no more than 2 per cent. when compared with good English winter wheat.

Bread made of spring wheat is rather less white than that made of the better sorts of winter wheat; but it is allowed to be more palatable in Lincolnshire, where it is best known. Both these qualities are probably owing to the excess of gluten contained in it.

J. B.

II.

Spring Wheat. By Mr. Peter Sers.

To the Honourable Board of Agriculture.

I MOST humbly beg to inform you, I have this year grown 241 acres of spring wheat, and a good crop, and expect four quarters per acre, except a part of it that is laid down for grass, and on that I sow about nine pecks per acre, which I will venture to say has more than three quarters per acre; only on all our land we keep under plough,
we

we sow 14 pecks per acre. I have several sorts of soil, such as sandy, and very light earth, also mixed earth, and very strong clay, and it seems to suit every sort; and we sow from the 25th of March until the 4th of May; and the destructive worm, which has done me the greatest damage on my winter wheat, sown in autumn, which the worm takes when we only begin to sow our spring wheat, and it has not been hurt. We sowed a deal last year, and not any of it hurt with the fatal mildew, which nearly destroyed me 250 acres of winter wheat, and by the help of our spring wheat, which was so good, we mixed it together, and greatly helped the sale. I have taken the liberty of sending Sir Joseph Banks samples both of last year and this, in the straw, &c. and I hope his Honour will shew you; and any further information I can offer to the Honourable Committee, will give me the greatest pleasure.

From your most obedient and humble servant,

PETER SERS.

Gedney, Lincolnshire, Sept. 28, 1805.

This is to certify, that on the 20th of Sept. 1805, I finished measuring for Mr. Sers, of Gedney, 241 acres of spring wheat.

FRANCIS GRANT,
Surveyor, Long Sutton.

Mr. Sers' Letter to Sir Joseph Banks, Bart.

I HAVE, by the coach, sent your Honour samples both of spring and winter wheat, of this year (1805), now threshed, which your kindness will shew to the Board; and of our large quantity cannot see it is injured; it weighs as heavy as any red wheat we have grown. We have sold a small time back 200 *qrs.* to a merchant, mixed $\frac{3}{4}$ spring wheat to $\frac{1}{4}$ red of winter wheat, at full an average price with us of any quantity or quality sold in our markets to merchants; and we weighed several cooms, that is 4 bushels, and they weighed $17\frac{1}{2}$ *st.* neat each, which is more than any wheat of mine has before weighed; though the corn is not large, is full, and goes close together. I fully think with you, that if winter wheat be damaged, it would be a good way to sow some spring wheat by a man about Lady-day, in the vacant places, and rake it in, as it is sure to be fit to cut with the winter wheat, and, when threshed together, no body can tell it.

III.

Spring Wheat. By John Coggan, Esq.

HAVING observed in the public prints an advertisement from the Board of Agriculture, dated the 12th of April, 1805, stating, " That the Board, having received information from various districts of the benefit arising from the cultivation of spring wheat, and it appearing to the Board, that at that period it might be particularly useful to promote that object,

" Resolved to offer the following premiums, viz. To the person who shall, in the spring of 1805, cultivate the greatest number of acres of spring wheat, not less than twenty, fifty guineas, or a piece of plate of that value; and for the next greater quantity, thirty guineas, or a piece of plate of that value."

Wishing as much as possible, under existing circumstances, to meet the Board's intentions, I have sown twenty-two acres and a half of land with spring wheat, seventeen and a half of which is little better than a common. Had the advertisement appeared sooner, I should have reserved land, that had been long in cultivation, for this purpose; nor is it in my power at the day appointed, namely, to-morrow, to deliver in a just
account

account of the produce; a few days, however, will enable me to do it. But whether this delay will exclude me the premium or not, I shall most readily give the Board every information in my power, and cheerfully submit to their determination, only stating, that from the lateness of the harvest being got in I have not been enabled to get the spring wheat threshed out, without neglecting other parts of my business.

I cannot, however, flatter myself the produce of the twenty-two acres and a half will be more than twelve loads of marketable wheat.

Our common was inclosed in 1803: in September of that year I grubbed up the furze, and in the spring of 1804 ploughed five acres of it very deep, and planted potatoes, which yielded above four hundred bushels per acre. In the spring of 1805 this land was sown with spring wheat, on the 11th day of April.

Three other acres of this field was, in the year 1804, sowed with hog peas, upon one ploughing, and produced a very good crop. These three acres were ploughed in February, 1805, and on the 11th day of April sown with spring wheat.

Eight other acres of this land was broke up in January, 1804, and sowed with turnips in June, and fed off with sheep early in spring 1805; then sown with spring wheat on the 11th day of April. The above sixteen acres are in one field. The
foil

soil light sandy loam. The crops ripened nearly at the same time: that sowed in May was quite as good and as forward as that sown in April.

For experiment only I unturfed an acre and a half more of the common, took away the turf, and upon one ploughing sowed the spring wheat on the 1st day of April, 1805. The seed came up very well, but went off very fast in about a month after, and was a very light crop at harvest. This soil was a strong loam, inclinable to clay, very cold and wet.

Five other acres, which had been in cultivation for many years, was at the time it came into my hands (by the inclosure, 1803), an oat stubble; had been much neglected, and of course both poor and foul. This I summer-fallowed in 1804, until the month of August, and sowed it with turnips, which were fed off with sheep in spring 1805: ploughed early in April, and sowed with spring wheat on the 19th of April, 1805. Three bushels of seed wheat were sown on every acre, broad-cast.

The wheat, that was sown upon the common, is all of a very dark colour, is very cold; it weighs fifty-six pounds and a half per bushel of eight gallons, and at market fifteen guineas per load was offered for it. I did not observe any appearance of blight during the time of its growing; but the violent storm in July beat it all down flat,
and

and it suffered very much from that circumstance, I am convinced.

The wheat sown upon the five acres of arable land is of a fine colour, and of an excellent quality; except that it partakes of a little smut. This wheat recovered itself after the storm in July: it weighs fifty nine pounds and an half per bushel of eight gallons, and seventeen pounds ten shillings per load was offered for it at market on Friday last.

I cannot tell the name of the feed wheat; the greater part of it was procured for me, as spring wheat, at Rye in Sussex. It is a bearded wheat; but as I send samples of it in the straw, as well as samples of it in corn, the Board will be best able to determine what the wheat is.

I beg leave to caution the Board against an idea that prevails, that any wheat sown as late as February is entitled to the appellation of spring wheat. Indeed it would (if I may be allowed to make the observation) have been better, had the advertisement stated, that no wheat would be considered as spring wheat, that was sown sooner than the middle of March.

All my spring wheat came up in a few days after it was sown, was regular, and wonderfully quick growing, being as forward at the harvest as the autumn sown wheat. The red gum attacked my autumn wheat, but did not affect the
spring

spring wheat in the adjoining field; in fact, it might be considered as the same field, being only separated by a ditch and a new quick hedge only ten inches high.

My experiments, it will appear, have been made under great disadvantage, only five acres of it being properly arable, and that in an exhausted state; the remainder all a furze common, without manure, and which had not been broken up beyond the memory of man.

Some years ago I tried a single acre of spring wheat in this parish, sown as late as the 4th day of May. The season was wet, the land in a high state of cultivation, but sandy; it produced five quarters per acre, was of fine quality, and fetched a good price. And had not my land laid in small parcels, it was my intention at that time to have made further trial to a great extent; but I could not carry it into practice but at the prejudice of other persons' crops, the land laying at tenantry.

If time can be allowed me, I shall furnish the Board with every particular as to produce of flour, &c. I am threshing with a mill, and suppose ten days or a fortnight would be the extent of the time required. If I am favoured with an answer to this, I request it may be directed for me at the East India House, or at Laleham, near Staines, Middlesex.

I am, Sir, your most humble servant,
JOHN COGGAN.

Laleham, February 3, 1806.

Enclosed is the certificate of Thomas Harrison, of Laleham, as to the quantity and quality of the land.

P. S. I beg leave to add, that in case the above-mentioned quantity of land should not entitle me to the first premium, I consider myself a candidate for the second, which relates to cultivation, and not quantity.

I Thomas Harrison, of the parish of Laleham, in the county of Middlesex, farmer, do certify, that John Coggan, Esq. of the parish of Laleham, sowed twenty-two and a half acres of spring wheat, part of which was sowed upon land lately brought into tillage, and part upon land lately inclosed, and had been much neglected. The above land was measured by me to ascertain the quantity, and which measured twenty-two acres and a half statute measure. The wheat was sown between the 1st day of April and the 1st day of May, 1805.

Given under my hand this 30th day of January, 1806.

THOMAS HARRISON.

IV.

Spring Wheat. By Mr. Calthrop.

“ THE Board of Agriculture having received information from various districts, of the benefit arising from the cultivation of spring wheat, and it appearing to the Board that at the present period it may be particularly useful to promote that object, have resolved to offer the following premiums:

“ To the person who shall, in the spring of 1805, cultivate the greatest number of acres of spring wheat, not less than twenty, fifty guineas, or a piece of plate of that value.

“ Accounts verified by certificates to be produced on or before the first Tuesday in February 1806.—It is required that the soil, quantity of seed, sort of wheat, time of sowing, produce and value of the crop, and the effects of any distemper which may attack the plants, be reported.

“ For the next greatest quantity thirty guineas, or a piece of plate of that value.

“ For the next greatest quantity twenty guineas, or a piece of plate of that value.

“ The Board has been informed, that the true spring wheat may be sown successfully so late as the end of April. Several correspondents on the subject

subject of the late harvest observed, that the spring wheat had escaped the mildew in parts of the country where the autumnal had not, and yielded better.

“ To the person, who shall report to the Board the result of the most satisfactory experiments on spring wheat, which shall ascertain the soil, the sort of wheat, the time of sowing, the produce and value, the comparative advantages of this and common wheat, and any other circumstances useful to be known, a piece of plate of the value of twenty pounds.—To be produced on or before the first Tuesday in April 1807.”

From the foregoing advertisement, I am tempted to submit the following account:

An Account of Spring Wheat, the Produce of 82 Acres 14 Perches of Land in Gosberton Fen, (which has been inclosed six Years last Lady-Day), cultivated by J. G. Calthrop, of Gosberton, in the County of Lincoln, in the Spring of 1805.

<i>Soil.</i>		A.	R.	P.
Moor upon clay	-	42	0	14
Moor upon sand	-	40	0	0
Total	-	82	0	14

Sort

Sort of Wheat.—Horned or rough-eared spring wheat.

Quantity of Seed.—20 quarters, which is 8 pecks per acre. The 14 perches were included in the 20 quarters.

<i>Produce.</i>	QRS.	C.	S.
Good wheat	413	1	3
Refuse, or hinder ends	26	1	2
Total	440	1	1

Value of the Crop.

QRS.	C.	S.		£.	s.	d.
413	1	3	at 50s.	=	1034	13 9
26	1	2	at 25s.	=	33	8 9
Total	440	1	1	=	1068	2 6

Effects of Distemper in the Plants.—The crop suffered in some slight degree from the smut, or bunt; the usual effects of which disease are, that the ear of the plant affected assumes the appearance of a black powder.

I have been in the habit of growing spring wheat for twenty-five years, and never knew it suffer

suffer from the mildew, as winter wheat frequently does.

J. G. CALTHROP.

We whose names are hereunto subscribed do certify, that the above is a true statement. Witness our hands this 18th day of January, 1806.

W. BARNES, Minister of Gosberton.

W. DODS, } Churchwardens and Over-
HENRY SYSON, } seers of the Poor.

V.

Spring Wheat. By Nathaniel Wedd, Esq.

SIR,

I HAVE been given to understand, by an agricultural gentleman, that a premium of fifty guineas is offered by the Board for the largest grower of spring wheat last year.

I do not find that premium among the printed list I have for 1803. However, I send inclosed a certificate of my quantity, agreeably to what I am informed is required by the Board.

I am, Sir, your most obedient servant,
No. V.

January 31, 1806.

To the Secretary of the Board of Agriculture.

Nathaniel

Nathaniel Wedd, of Trumpington, Cambridge-shire, certifies, that all the particulars contained in the Paper No. V. are strictly true. And that the 82 acres 2 roods 7 perches of spring wheat were grown by him at Soham, in the county of Cambridge, in the year 1805.

January 31, 1806.

I do certify, that Mr. Nathaniel Wedd, of Trumpington, Cambridgeshire, did grow 82 acres 2 roods 7 perches of spring wheat at Soham, in Cambridgeshire, in the year 1805; and that every other particular relating to spring wheat contained in the Paper No. V. to be strictly true.

DAVID ELLIS,
Bailiff to Nathaniel Wedd.

January 31, 1806.

The quantity of spring wheat grown by No. V. in 1805 is 82 acres 2 roods 7 perches. Half of this quantity is estimated at 4 quarters per acre; the other half at 3 quarters 4 bushels per acre.

The quantity can only be estimated, as a small part of it only is yet threshed out.

A sample of the produce, and a few ears of wheat, are inclosed with these particulars: most of these ears are set five kernels broad, which is not often found in any wheat.

This

This was nearly all grown upon fen land, with turf earth underneath, which is most adapted to the growth of spring wheat; as fen land in the spring will grow more rapidly than any other.

The previous cultivation was ploughing, then burning, sowed with cole-seed, fed off by sheep, and then sowed with spring wheat. The first sowing commenced the beginning of March, and finished as late as the last day in April. The earliest sown is the best quality, and the produce the greatest. Average value is about £10. per acre.

Spring wheat was always free from mildew at the time red and white wheat were much affected by it.

Quantity of seed per acre two bushels; but the earlier sown the less seed will be required.

VI.

Spring Wheat. By Mr. William Speechly.

MY LORD,

IT is highly probable that the cultivation of spring wheat will, in the general, prove an eligible expedient; and indeed in times of scarcity it may constantly become a measure of absolute necessity.

But the quantity of spring wheat requiring annually to be sown will depend on various circumstances, particularly the following:

First, The prospect and appearance of the autumnal sown crop of wheat in the spring.

Secondly, The price of wheat at the time being.

Thirdly, The stock of corn on hand.

Lastly, The probable prospect of obtaining a supply of wheat from abroad.

First, Whenever there is a general appearance of defect or deficiency in the autumnal sown crop in the early spring months, whether from the preceding seed-time having been unfavourable,—from the severity of the winter,—from long continued rainy seasons,—or from whatever cause;

D

in

in such case, spring wheat ought to be sown in such proportion as may suffice for yielding a produce equivalent to such seeming defect or deficiency.

Secondly, At any future period when wheat may bear a high price in the spring, it will constantly be found, that this circumstance alone will operate more with the farmer than every other cause herein stated united; and will, it may be presumed, without any stimulus from the Board of Agriculture, induce him to sow spring wheat with a liberal hand.

Thirdly, Should the stock of wheat on hand prove scanty, or of inferior quality, either from mildew, or from the preceding season having been unpropitious, such circumstance would also tend to shew the necessity of having recourse to the sowing of spring wheat, in order to augment the stock.

Lastly, In time of scarcity of corn in this island, whether from an unfavourable season, from mildew, or from whatever cause, in such case it will at all times be highly important for to be generally known, whether such cause or causes may have also existed abroad, and particularly in the northern parts of Europe, from whence large supplies of corn have constantly been obtained.

But in the present channel of communication,

tion, such information is rarely obtained by the farmer, whose knowledge in these matters seldom extends beyond the vague reports of the vicinity, in which he resides.

Now, as every information coming from the Honourable Board is universally considered as strictly authentic, I will beg leave to submit it to your Lordship's consideration, whether it would not be right and proper for the Board annually to make such information, on the foregoing subject, as may be deemed requisite and necessary, and then to report the same to the public accordingly.

As the cultivation of spring wheat has not hitherto been in general practice, it would be highly commendable in such persons making essays therein, to report to the Board the nature and state of the soil, &c. in the which it may have been found to be most successful.

The following experiments were made:
First, with a view to ascertain the comparative difference in point of *quantity*, between autumnal sown lammas wheat, and spring wheat, on clover lea.

Secondly, The effect of top-dressings on spring wheat, on clover lea.

Likewise, Whether spring wheat, sown on clover lea, or upon turnip fallow, would prove the more successful.

EXPERIMENT I.

In October, 1804, one half of a close (called Little Stocking), containing eight acres, was sown with lammas wheat, on clover lea. The soil a crumbly loam, but thin, by laying near a scaly rock bottom.

On the 10th and 11th of April, 1805, the remaining half of the close was also sown with spring wheat; and on a small portion of which the following top-dressings were applied:

No. 1. Dove manure.

2. Soot.

3. *A compost of sheep dung, leaves of trees, &c.

4. Very rotten stable yard manure.

The

* This compost can be thus obtained. It is observable that sheep in pasture grounds, during a hot and sultry season, constantly gather together in shady places, often under spreading trees, and in ditch bottoms, near the fences. When the flock is numerous, large quantities of their dung may from time to time be collected.

When scraped up, the leaves of trees, rotten wood, and even a part of the top soil which may have been trodden up, may likewise be added thereto. The latter, by having imbibed

The pigeons' dung was from my own dovecot, but, if it had been purchased, it would have cost at the rate of ten shillings per quarter.

For the foot I paid three shillings per quarter, at Nottingham, a distance of upwards of seven miles from hence. The expence, therefore, of carriage and spreading, &c. greatly enhances the charge of this article.

No. 1 and No. 2 were laid on with such apportionment as to bring the whole expence of each to between twenty and thirty shillings per acre.

No. 3 and No. 4 were laid on discretionarily.

The Result of Experiment I.

The crop throughout was slender, both in the autumnal and spring sown. Indeed I purposely

imbibed the urine of the sheep, may be considered as a proper ingredient.

When the hot season is over, the whole should be brought into an heap. In the winter let the heap be turned over, which by breaking and mixing will cause it to meliorate, and by the spring it will become a rich and uniform compost.

posely made choice of this thin and weak soil, supposing from thence that the effect of the top-dressings would appear the more distinguishable.

Qrs. Bus.

When threshed, the division of autumnal sown lammas wheat did not yield a produce per acre of more than

	-	-	-	2	5
The spring wheat (where not any top-dressings were applied) only				2	1 $\frac{1}{2}$
Difference in favour of lammas wheat	o				3 $\frac{1}{2}$

Of the Top-dressings.

(No. 1.) The dove manure was somewhat the best.*

(No.

* Pigeons dung, after having undergone a fermentation, may be considered as one of the most powerful of manures, and also as one of the most eligible for a top-dressing.

Of this powerful manure, the smallness of the quantity, requisite for a top-dressing, renders it most exceedingly accommodate in the application.

But pigeons dung is often injudiciously applied as a top-dressing in the state, in which it comes from the dovecot.

It

(No. 2.) Soot very little inferior to No. 1.

(No. 3.) The compost of sheeps' dung, &c. proved only about equal to rotten stable manure (No. 4.), and did not exceed it, as I was in expectation it would have done.

Their produce appeared in the following proportions above the average of the crop, where not any top-dressings were applied:

		Qrs.	Bus.
No. 1. Dove manure	} per acre	- 0	6
No. 2. Soot -			
			No.

It should be considered, that manures acquire powers and strength by fermentation (somewhat similar to that of fermented liquors); therefore, when the dovecot is cleaned out, the pigeon dung should be well moistened with water, and laid in an heap in a close and dry place, to *couch*. In the course of a few days a strong heat is generally brought on, which when obtained, the outside of the heap should be again watered, and the whole turned over. In this turning care should be had to put the outside of the former into the middle of the second heap, to give uniformity to the whole.

In small dovecots, where the quantity of pigeons dung may be insufficient to bring on a fermentation, it may readily be acquired by the aid of a little fresh dung from the stable.

On a layer of stable dung, of about two feet in thickness, the pigeons dung should be put in an heap. Then if a competent quantity of dung be laid over the heap, it will speedily bring on a fermentation.

	Qrs.	Bus.
No. 3. Compost of sheeps' dung, &c.	}	per acre - 0 3
No. 4. Rotten stable yard manure - -		

As the various portions of corn, where the top-dressings were applied, would have required much barn room to have been separately kept; as it would also have been both troublesome and expensive in threshing and dressing up each by itself, and after all very subject to error by the respective labourers employed; I thought it therefore best by endeavouring to form a judgment of each from its *bulk* and *quality* when cut, and by afterwards coming to the knowledge of the produce of the general crop (after having been threshed,) where not any top-dressings were applied, I trust that I could not have erred much by estimating from their various comparative differences.

EXPERIMENT II.

On the 22d and 23d of April, 1805, a close (called West Feld Close) containing four acres, was sown with spring wheat on turnip fallow, the soil a deep loam, and in a high state of cultivation.

The

The turnip crop (which had been eaten off the ground by sheep), was throughout unusually fine, and perfectly free from weeds.* It may be proper here to observe, that this close had also been sown with turnips the preceding year, viz. in 1803, but as the ground could not then be got clean of weed, &c. the turnip crop was but very indifferent. Instead, therefore, of sowing barley (as should have been in common course of husbandry), I again fallowed. This brought the land into excellent condition, and it was again sown with turnips in 1804 also.

The Result of Experiment II.

The wheat crop from the beginning showed the highest marks of vigour; and what was very fortunate

* On land of good quality, and in a high state of cultivation, the turnip crop will most generally be found to repay amply for a second hoeing. But notwithstanding the regular hoeings, on land subject to various kinds of tall growing weeds, many that escape the hoe soon afterwards make their appearance, and overtop the turnips. In such case I have often found it needful to hand-weed them, when the turnip crop has been far advanced.

This work is generally performed by women and boys.

Tall

fortunate in so generally heavy crop, not any part thereof was lodged or laid when cut (about one rood was gently *lolloed*, as the workmen term it.)

When nearly ready for the sickle, my neighbours, who had long had their eyes upon it, estimated the crop at upwards of four quarters per acre. The crop was cut on the 12th of September. From the number of sheaves per acre, and from the produce of what has already been threshed out, there are grounds for supposing that it will make good the foregoing calculations.

But the wheat proving of the first quality (a sample of which shall accompany this paper to the Board), I shall reserve the principal part of the produce in the straw, until the spring, for feed.

General Observations.

1. It may be proper to observe, that the spring wheat crop, both in Experiment I. and II. was
ready

Tall growing weeds, that rise above the turnips, tend to exhaust the soil, to render the crop unsightly, and late in the autumn they perfect and sow their seed; the ground thereby becomes subject to be again over-run with their various destructive species.

ready to cut quite as early as my autumnal sown wheat on similar soil and situation, although the close, Experiment II. was not sown until the 22d and 23d of April.

2. It is highly probable, that the success of spring wheat on clover lea may hereafter be found to depend more on the coming season, than autumnal sown wheat. If the following season should prove dry, the crop would, one may well suppose, be more hazardous in the former than in the latter. In a dry summer, it may seem that spring wheat would have a better chance upon land, that has been longer upon tillage, than upon clover lea.

3. Turnip and rape fallow, where the soil is not too light, seem highly proper for spring wheat.

4. Pease and bean fallow may also in many instances prove eligible for spring wheat, and especially after having been ploughed early in the autumn, and benefited by the winter's rains and frost.

5. In the common course of husbandry, the close, Experiment II. should have been sown with barley, and at the same time have been lain down in seeds. Therefore, when the spring wheat was harrowed in, at the last light harrowing, clover seeds, &c. were also sown. The ground

is

is now well set, and the seeds have prospered equal to any I ever saw.

6. The difference in produce, in point of *quantity*, between Experiment I. on clover lea, and Experiment II. on turnip fallow, ought not to be considered as any data to go upon in future experiments; because the superior quality and state of the soil in the close, Experiment II. might reasonably have been expected to have given nearly such decided difference.

7. In the application of top-dressings for spring wheat it may seem, that in a long continued dry season the most eligible way would be by applying them at the same time, when the wheat is sown. Only once lightly harrowing after may suffice.

8. But in a moist and continued rainy season, top-dressing would probably prove to act more powerfully by being sown upon the surface of the soil; because top-dressings are most particularly calculated to invigorate the coronal roots of the wheat plants, and thereby to cause them to tiller well.

9. When top-dressings are sown on the surface of the soil, the best time of applying them, it may seem, would be when the wheat is grown to the height of three or four inches; because if laid on before the blades of the corn crop afford

afford a kind of shelter, the finer particles thereof are liable either of being exhaled by the sun, or blown away by high winds, which frequently occur at that season. Moist and showery weather, at that critical period, will always be found of the highest importance; therefore the farmer would do well by having due attention to the state of the weather, when employed on this business.

10. As a crop of spring wheat is so much more valuable than of any other kind of spring sown corn, there are good grounds for supposing that top-dressings cannot any other way be more beneficially employed.

Before I quit these remarks, I will beg permission to state a further advantage in the cultivation of spring wheat.

11. On various soils, and in some seasons, it often happens that the autumnal sown crop of wheat may be seen to fail and go off in patches.

In the beginning of April, by raking spring wheat into the vacant places, as also where the wheat plants may appear weak and thin set, the uniformity of the crop can be restored, and the spring wheat will be ready for the sickle quite as early as the autumnal sown.

And although such seeming kind of mixture in the crop would render its produce highly improper

improper for seed, still, for the miller's use, no objectionable defect or deficiency would be found therein from such apparent mixture.

The Rt. Hon. Lord Sheffield,
P. B. A.

Woodborough Hall, near Nottingham,
January the 2d, 1806.

FINIS.

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1

2

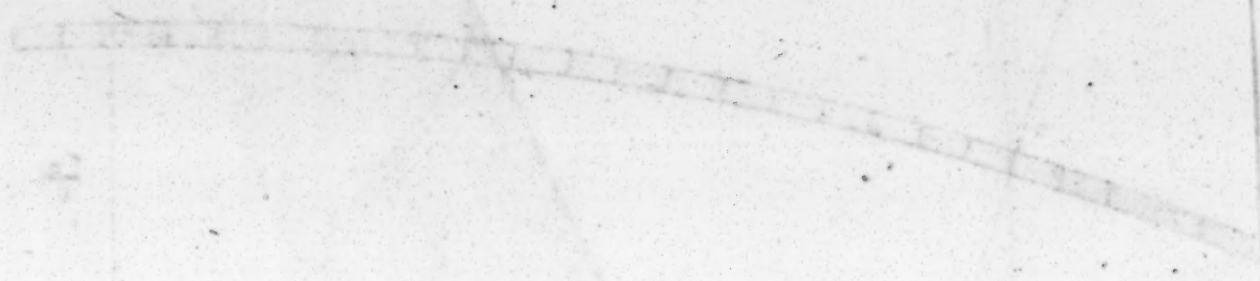
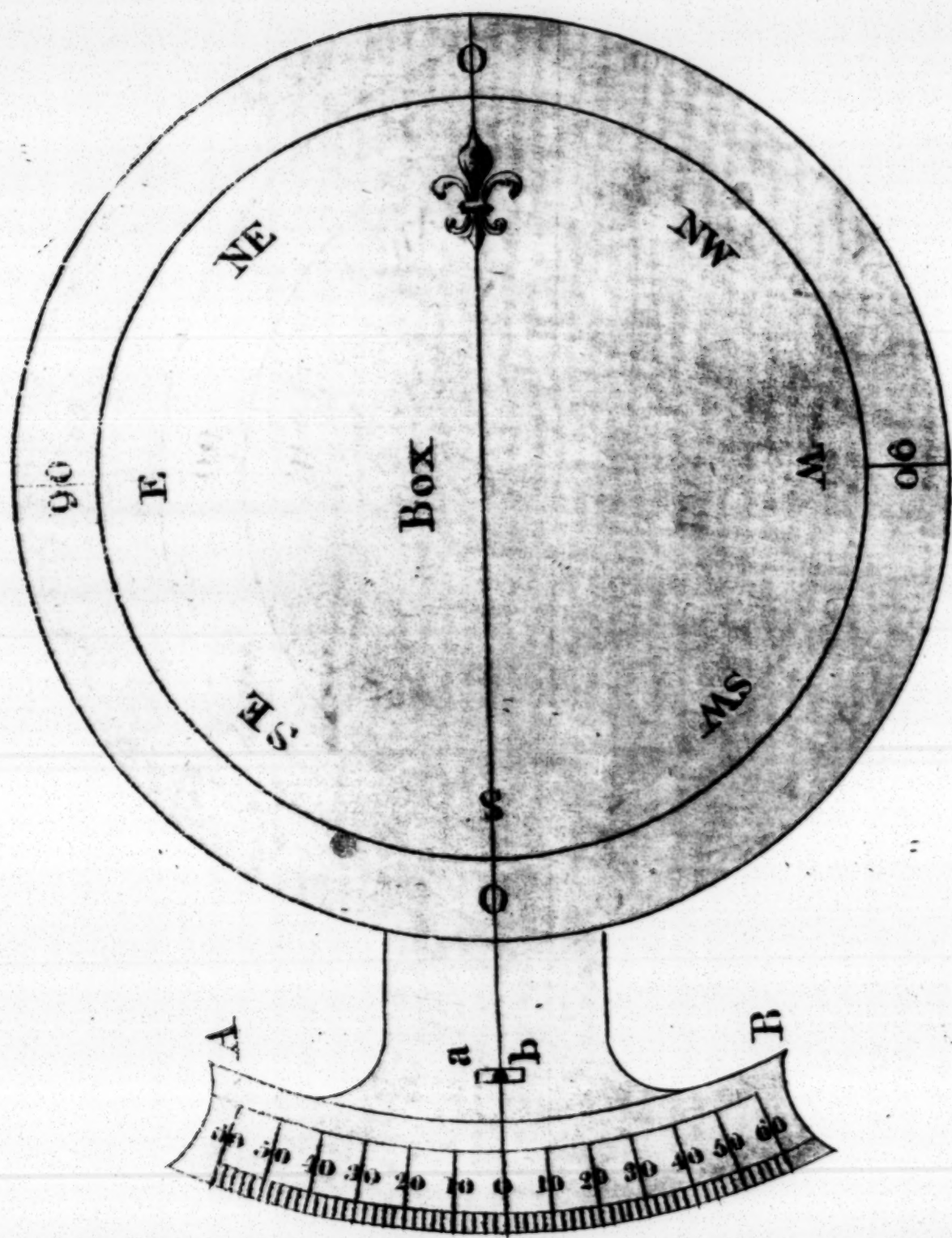


Fig. 1.



Verniers



Scale of Depression.

Fig. 2.

Index.

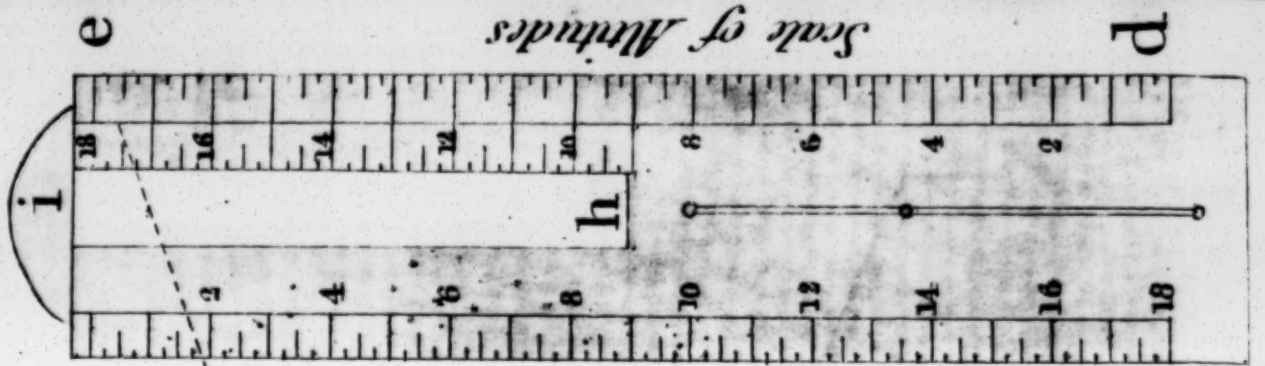
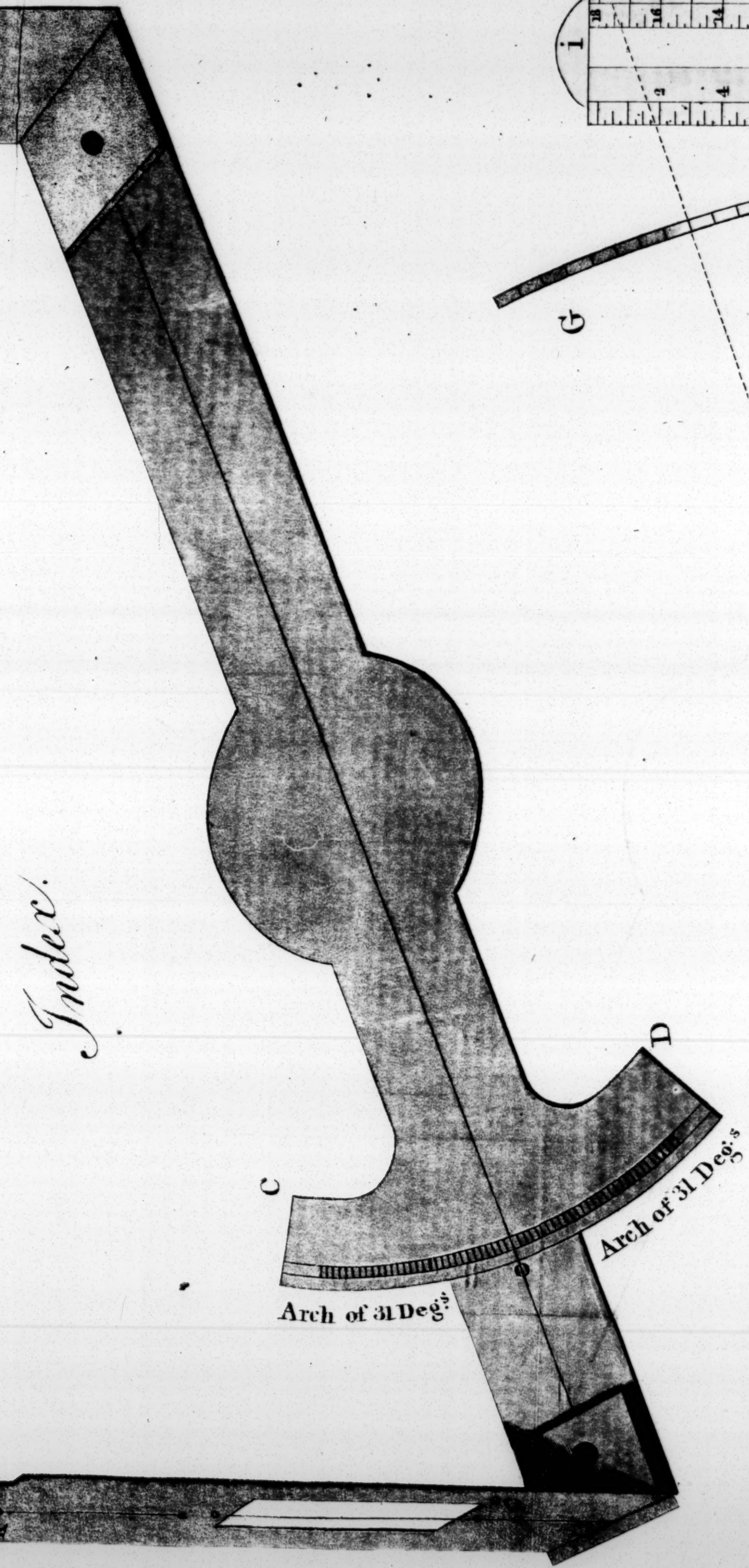
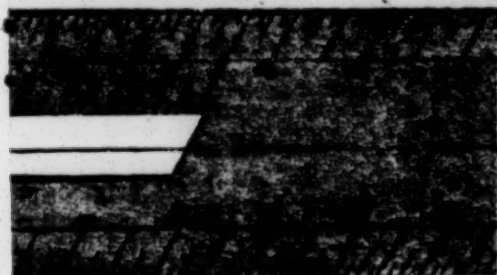


Fig. 3.

F

E

le of Altitudes.



of Depression.

ON THE
IMPROVEMENT
OF THE
CIRCUMFERENTOR.

BY
MR. FREEMAN.

To the Right Honourable and Honourable
THE DUBLIN SOCIETY,
FOR PROMOTING USEFUL ARTS, &c.

*Are respectfully submitted the following Improvements
of the Circumferentor, or Common Surveying
Compass, and Calculation.*

BY the former, the bearings or courses can be taken to one minute of a degree, and angles of altitude or depression of hills readily ascertained, from which, with the distance of the stationary line, measured on the slant surface, the horizontal distance may be expeditiously determined.

By the latter, it is shewn how the bearings may be corrected for the effect of the *diurnal variation*, in order to reduce the needle to a parallel position throughout a survey, by which

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the

the quantity of land can be calculated with greater precision than by the method hitherto practised, in which this correction is not taken into view.

A DESCRIPTION OF THE IMPROVED CIRCUMFERENTOR.

OF THE BOX. (*Fig. 1.*)—This is to be attached to the index, so as to be easily moved on its centre, the manner of doing which, being well known to mathematical instrument-makers, need not be particularized. The diameter within the ring will not require to be more than $4\frac{3}{4}$ inches. The circle to be graduated into degrees, and numbered each way, from the north and south points, to 90. The E. W. and intermediate points, to be lettered contrary to their situation in the horizon, as is usual in the common instruments. It will be necessary to have two spirit-levels in the box, one placed N. and S. and the other E. and W. The former, in particular, should be as large, both in length and diameter, as the box will admit, and both fixed so as to be occasionally adjusted. A spring to lift the needle off the centre-pin, when not in use, will also be requisite.

OF THE VERNIERS. (*Fig 1.*) From the bottom of the box, a plate (AB) is to extend of $1\frac{1}{2}$
or

or 2 inches in length, over the index, on which plate *two verniers* are to be graduated, one on each side of the middle line marked O, which is the meridian of the box continued.

Each vernier to be equal in length to 31 degrees of the arch, (CD, *Fig. 2.*) and divided into 30 equal parts, every fifth division of which is to be numbered 10, 20, 30, 40, 50, 60, so that the value of each division will be two minutes. The first division will therefore extend 2 minutes beyond the first degree on the arch of the index; the second division will extend 4 minutes beyond the second degree on the arch, and so on; each division increasing by an excess of two minutes, by which the 30 divisions of the vernier will divide one degree on the arch into 30 equal parts of 2 minutes each. Hence, if either vernier be moved contrary to the order, in which it is numbered, that is, if the first division is moved to coincide with the first degree on the arch, the vernier will then have moved 2 minutes. If the 2d division on the vernier is brought to coincide with the 2d degree on the arch, the vernier will then have moved 4 minutes, and so on, every division increasing 2 minutes. Consequently, when any division on the vernier coincides with any degree on the arch, such division will shew the number of minutes on the vernier, that the beginning of it was moved from the middle line

of the index, or the minutes that any degree in the box was moved, at the same time, as the degrees in the box and those on the arch will be concentric, and correspond exactly with each other.

Therefore, the minutes in any part of a degree, at which the needle settles, can be ascertained by moving the next less whole degree to the point of the needle. If the box was divided into half-degrees, each vernier would then contain but 15 divisions of 2 minutes each, which would require the arch to be but *one-fourth* of the length of that above mentioned, but the former is rather the most simple construction. Or, the box may be graduated into half degrees, and each vernier into 30 parts, equal to 31 divisions on its correspondent arch; then the verniers would be only *half* the length of the first mentioned, and would shew single minutes. The choice of these three constructions is left to the Surveyor, all being equally accurate. The verniers should be made to lie close to the arch and be easily moved, to effect which the box should turn freely on its centre, and the plate of the vernier made a little hollow at the under side, except that part near the edge, that there might be as little friction as possible against the index.

A SCREW, to press the verniers occasionally against the index, is to pass through the aperture,
a b,

a b, and take hold in the index. It should be made with shoulders, to project a little over the sides of the aperture, which will require to be about half-an-inch long, sufficient to contain the screw, and permit the verniers to move one degree on each side of it.

THE INDEX is to be the form of those commonly made, except the arch CD, to correspond with the verniers, and which may be formed as in Fig. 2. The arch, as first described, will contain 62 degrees, that is, 31 on each side of the middle line of the index; but these are not to have numerical figures applied to them.

Fig. 3.—To CONSTRUCT A SCALE OF TANGENTS, by which angles of altitude, or depression, can be taken by the circumferentor :

This scale is to be graduated on one of the sights of the instrument in the following manner:

A small hole (as at c) just large enough to admit of perfect vision, is to be made in the sight, that stands at the south end of the index, a little above the plane of the lid of the box; the vernier being pressed moderately against the arch by the screw, and the instrument then set truly level, a point is to be marked at the edge of the opposite sight at d, exactly horizontal with the centre of the

the hole at *c* ; which point is to be the beginning of the scale of tangents or altitudes, the radius of which is the distance between the sights from *c* to *d* ; and let the distance from *c*, to a point at *e*, be also measured, and if the sight is not truly perpendicular to the horizontal line *c d*, the graduations will nevertheless be correct, as the sight will have the same position, when placed on the dividing plate according to these dimensions, that it had when it stood on the index. The sector, *EFG*, represents a part of the circular dividing-plate, used by mathematical instrument-makers, on which what is to contain the scale is to be laid, with the points *d*, and *e*, precisely at the distance from the centre of the plate that they were from the hole at *c*, when on the index, and *d* is to coincide with one of the degrees on the plate, and the sight will then be in the proper position for graduating. A ruler, laid from the centre of the plate to each degree, half, &c. on the circle thereof, and points correspondent thereto, marked on the edge *d e*, of the sight, will be a scale of altitudes, the divisions of which may be drawn and numbered as in the figure. The graduations that are opposite to the large aperture, *hi*, may be transferred to the edge of it, which, in some cases, will be more convenient than those at the out-edge, particularly in taking an observation of the sun for finding the variation of the
compass,

compass, or the latitude. At the other edge of the sight, a scale may be also engraved to take angles of depression, which will only be an inverted position of the first scale of altitudes, if both sights are perpendicular to the horizontal line *cd*. A hole being made, as at *k*, near the top of the south sight, level with the beginning of the scale, the degrees of the first scale may be transferred thereto with a pair of dividers, measuring from the lower end upwards in the first, and from the upper end downwards in the last, and numbered in the same way. But as the scale of altitudes may supersede the use of a scale of depressions, the latter would seldom be necessary; for, in measuring down a hill, the declivity could be found as well by taking back-sights with the scale of altitudes, as to take fore-sights by the other. When the radius, or distance between the sights, is 16 inches, a degree on the scale of tangents will be about three tenths of an inch; and if the sight be 6 inches long, it will contain 18 degrees of altitude, which might be further lengthened by a thin plate of brass fitted to slide a short distance down at the top of the sight, and the graduations continued on it. But in practice there will seldom be occasion for so great an altitude as the sight contains.

OF

OF THE USE OF THE IMPROVED CIRCUMFERENTOR.

OF THE VERNIERS.—One of these being numbered towards the right, and the other to the left, they are adapted to the degrees of the quartered compass in the box, which are also numbered in the same manner from the meridian. Therefore, when the needle rests between any two degrees, suppose between 25th and 26th, in the N. E. or S. W. quadrants, which are numbered towards the left, the verniers are then to be moved to the right, till the 25th or greatest whole degree comes exactly opposite to the end of the needle; then the division on the left vernier, which coincides with any degree on the arch, will shew the number of minutes to be set down in the field-book, with the 25 degrees for the true bearing. In the N. W. and S. E. quadrants, where the degrees are numbered towards the right, the verniers are to be moved to the left, till the greatest whole degree comes precisely to the point of the needle; the division on the right vernier, which coincides with any division on the arch, will shew the number of minutes to be set down with the degrees. If any division on the vernier does not coincide with any one on the arch, a mean between the two nearest is to be taken.

taken. Thus, suppose the 2d and 3d beyond 40 on the vernier are the two nearest, that coincide with two on the arch, this would shew that the minutes were between 44 and 46, consequently 45 would be the true number. The same is to be observed in every similar case, by which any part of a degree in the box can be found to one minute. Always, when the minutes are read off, the vernier is to be moved back till *O*, on the vernier, coincides with *O*, on the arch, and the screw turned a little to retain it in that position, till the minutes of the next bearing are to be ascertained. The verniers are to be moved by taking the end of the arch of the index between the finger and thumb, and pressing the latter gently against the vernier, it can be immediately moved to the requisite position, at the same time observing when the proper degree comes to the point of the needle. A small cog-pin might be fixed under the index to move the verniers, but it is presumed it would not be so convenient as the above method. In windy weather, when the needle will not rest perfectly still, the greatest whole degree of the bearing is to be moved so that the needle may vibrate an equal distance, (perhaps 2 or 3 minutes) on each side of it, and the minutes shewn by the vernier may then be considered as correct. A small magnifier may be useful to some in observing the exact coincidence
of

of the needle with a degree in the box, or a division on the vernier with one on the arch. A glass of this kind, about $\frac{3}{4}$ of an inch in diameter, that will magnify two or three times, will be sufficient for the purpose. One of those that shut up in a handle will be most suitable to the pocket, but the rivet on which they turn, being commonly made of iron, will often affect the needle in some measure, if held side-ways from it. The best way of holding it will therefore be, to draw out the glass nearly at right-angles to the handle, by which the rivet will stand at some distance above the needle and not affect it. The observer should look through the middle of the glass, otherwise, the visual ray may be somewhat refracted, and cause the needle to appear a little out of its true situation.

The eye should of course be in or near the plane perpendicular to the needle, whether the magnifier is used or not. To prove that the bearings can be taken to one minute of a degree by this instrument, let the needle be set precisely to a degree, and then the vernier being moved one minute, it will be seen that the needle deviates a little from the degree, to which it was set, and consequently that such a small deviation is perceptible.

OF

OF THE USE OF THE SCALE OF TANGENTS OR ALTITUDES.

To take an angle of altitude with this, the instrument is to be set horizontal by the levels, particularly that which stands parallel to the index, the sights being directed towards the object; then the observer looking through the hole at c, and having moved the edge of the scale of altitudes in a direct line with the object, will immediately perceive whether any of the graduations coincide with it, and, if any one of them do, it will shew the altitude required; but if none of them coincide exactly, it will be seen what part of the edge, between two divisions, stands in the line of collimation, which intermediate part can be estimated within a few minutes, which will be sufficiently exact in an angle of this kind. If the scale of depression is to be used, the observer is to look through the hole at k, near the top of the sight, and by bringing the edge of the scale in a line with the object, the degree, or part that is coincident therewith, will be the angle of declivity. But this scale, as before observed, will be perhaps quite unnecessary, as its use may be supplied by the scale of altitudes, in taking back-sight. In either case, the observation may be taken to any object in or near the stationary line,
that

that is about the height of the instrument from the ground, as a bush, ditch, &c. so that the line of collimation may be parallel to the surface of the hill, which will render the aid of an assistant unnecessary, for the purpose of holding an object. In measuring a stationary line on the side of a hill or mountain, if the surface varies much in elevation, the different altitudes thereof should be taken, and the correspondent distances noted, from which the several horizontal distances may be found, and being added together will give the total distance. The angle of altitude or declivity, taken as a bearing, and the distance measured on the surface, being found in the first column of a table of difference of latitude and departure, the difference of latitude answering thereto will be the horizontal distance, while the angle is under 45 degrees, and the departure of the same will shew the *perpendicular* height of one end of the line above the other, if requisite to be known, and *vice versa*.

The angle of elevation will seldom, however, exceed 10 or 15 degrees. By this method, the horizontal distance can be found with more expedition and accuracy, than by the common way of holding up the lower end of the chain, in measuring up or down a hill, which in various respects is very incorrect, as must be evident to every judicious surveyor, and is also injurious to the
chain

chain by straining open the links and rings, and lengthening them. As surveyors may sometimes have occasion to find the variation of the compass, it may be ascertained by this instrument, by taking the sun's altitude and azimuth at the same time, either in the morning or afternoon, when within the reach of the scale of altitudes, from which it may be determined by the common proportion in spherics for that purpose.

A more simple method of finding the variation is, by equal altitudes of the sun taken in the fore and afternoon of the same day, when that luminary is some degrees above the horizon.

In this operation, it will be requisite to have a hair drawn tight horizontally round the sight, across the large aperture exactly at some degree; then having a dark or smoked glass to guard the eye from the sun, the observer, looking through the lower hole at c, will perceive when the lower limb of the sun just touches the cross-hair, bringing at the same instant the perpendicular hair in the sight in contact with his *eastern* limb; the needle will then point out the magnetical azimuth, and the horizontal hair the altitude, both of which are to be noted down, and when the sun descends nearly to the same altitude in the afternoon, the horizontal hair is to be set precisely to the same degree as in the morning, and when the lower limb touches it, the perpendicular hair is to

to be moved in contact with the *western* limb, and the needle will then shew the azimuth, which is always to be ascertained to a minute by the vernier. But in this azimuth a correction is to be made for the effect of the change of the sun's declination between the morning and afternoon observations. In north latitude, when the sun is advancing towards the elevated pole, that is from the 22d December to 20th June, this correction is to be subtracted from the western azimuth, and during the other half year it is to be added. Then half the difference between the fore and afternoon azimuths will be the variation. And if the western azimuth be the greatest, counting from the South, the variation is west, but if the eastern azimuth be the greatest, the variation is east. Thus, suppose on the 20th March, the azimuth of the sun's eastern limb in the morning, was S. 63° . 20'. E. which, counting from the South is - - - - - 63.20

And in the afternoon, when the

sun was exactly of the same
altitude, the azimuth was N.
 62° 25'. W. which is from
the South - - - - - 117.35

The daily change of the sun's declination at that time, suppose 22'. and that there were 10 hours between the two ob-

servations,

servations, the proportional
part for that interval is 9', the
effect of which on the azimuth
would be nearly about half,
which is to be subtracted, as
the sun is advancing north-
erly, - - - - -

0.4½

117.30½

Difference, - - 54.10

The half of which difference is
the variation, - - - - -

27.05

And the western azimuth being the greatest, the
variation is west.

OF THE DIURNAL VARIATION.

Though it has been ascertained for a consider-
able time past, that the needle makes a daily re-
volution, it does not appear that it has been
noticed in the practice of surveying, notwith-
standing it is indispensibly necessary to the
accurate performance of it, by a circumferentor.
This deviation is not quite regular at any time of
the year, but is however generally less in the
winter than during the other seasons. Sometimes
it does not exceed 6 or 7 minutes, and other
times

times it is above 20 minutes, and its motion is westward from about 9 o'clock in the morning to about one in the afternoon, and then remains stationary for some hours, when it again slowly recedes towards the east. And as the use of the needle in surveying is founded on the supposition of its parallelism throughout the day, it is evident that a deviation from that position must cause an error in a calculation made agreeably to such an hypothesis. It appears that the only method to remedy this is to make an allowance on the bearings or courses according to the time of the day, at which they were taken, as nearly as can be done.

For this purpose the surveyor should take the bearing of some small object, when he begins his survey, and another from the same place to the same object, when he has finished it, if it be the same day, and the difference between the bearings will give the deviation of the needle during the interval. And that he may be the better enabled to regulate this correction, it will be requisite for him to make experiments at home or elsewhere occasionally, by setting up his instrument where it will be free from any local attraction, and having set the needle exactly to a degree, it will be seen at what time it begins to move, how many minutes it moves before it becomes stationary, how long it remains so before
it

it begins to recede again towards the east, &c.; from which theory he will be able to ascertain, as nearly as practicable, the proper corrections to be made on the bearings, in order to reduce the magnetical meridians to parallelism throughout the survey.

Suppose the needle is found to move 15 minutes from 9 to 1 o'clock, that is, about 4 minutes an hour, or one every quarter, then on the bearings, taken about half-past 9 o'clock, two minutes are to be allowed; on one taken about 10, four minutes, and on one taken near 1 o'clock, fifteen minutes, and the same on every one taken after that the same day, till the needle begins to move again towards the east, from which time the west variation will be diminished, and is to be allowed accordingly. The variation being west is to be added to all bearings in the north-west and south-east quadrants, and subtracted in the north-east and south-west, still allowing it to the left. But if a survey be commenced, when the needle is receding towards the east, proportional parts for the time the survey is continued that day should be allowed as east variation, which is to be added to all bearings in the north-east and south-west quarters, and subtracted in the north-west and south-east. As surveyors do not generally take the bearings to less than a quarter of a degree, there are commonly several

F minutes

minutes lost, which often operating on the same side with the diurnal variation, the aggregate of both will necessarily cause a considerable error in the bearing, in which they occur, frequently amounting to more than 20 minutes of a degree, which on a line of 25 four-pole chains will throw it 15 links too far to the right, and in the same proportion for any greater or less distance or number of minutes. Hence it appears that considerable inaccuracies must arise, when the bearings are taken only to the nearest quarter of a degree, and the daily variation entirely omitted. But if the bearings are found to a minute by the IMPROVED CIRCUMFERENTOR, and corrections made for the difference of the daily variation, it is plain that the content must be determined with much greater precision than can be derived from the common practice and with very little extra trouble. Tables of difference of latitude and departure have hitherto been calculated only to every 15 minutes, but those, who wish to be more accurate, can find the latitude and departure to every minute in tables of natural sines and cosines. The table of multipliers of this kind in Gibson's Surveying is only for every quarter of a degree, and gives only half the departure, but it will certainly be more correct to use the whole departure as it stands in the table of natural sines, and then half the difference of the north and south

south products will be the true area. It is usual to take the latitude and departure only to the nearest link, but it will be found preferable to calculate them to tenths of links, and the northings, southings, eastings, and westings, being then equated in tenths of links, nearly in proportion to the lengths of the stationary lines, will be a further step towards obtaining a more correct area than could be determined by calculating only to the nearest whole link. It may not be improper here to observe, that the circumferentor has one particular advantage over any instrument of the theodolite kind, which is, that an inaccuracy in one bearing is not communicated to any other, which is not the case in the use of the theodolite, because the following angle still depends on the preceding, whether it be in taking the angles from the meridian by the instrument in the field, or finding them by having the angles of the field.

The circumferentor is also more expeditious, as there is only one observation to be taken at each station, but with the theodolite two are always requisite, which tends to multiply errors or small inaccuracies, and the more so when the theodolite is not divided to less than 5 minutes, which is frequently the case.

The subscriber being convinced that the foregoing improvements, if carried into effect, would be productive of great precision in the important

art of land surveying, by which stricter justice could be rendered between the landlord and tenant, which, it is presumed, must be particularly desirable on account of the present enhanced value of land in Ireland, therefore flatters himself, that this essay will not be found unworthy of the approbation and encouragement of that highly respectable Society of his native country, to whom, with due deference, it is submitted by

Their most Obedient,

And most Humble Servant,

RICHARD FREEMAN.

*United States of America,
Washington City, April 15, 1809.*

P. S.—R. F. is preparing Tables of difference of latitude and departure to a greater degree of precision than any yet published, which he hopes to have the honor of laying before the Dublin Society, in the course of next year, if the commercial intercourse between the two countries should be opened.

OBSERVATIONS

ON

MR. FREEMAN'S PAPER,

BY

MR. LYNCH, L. M. P. D. S.

To the Right Honourable and Honourable

THE DUBLIN SOCIETY.

GENTLEMEN,

AGREEABLE to your reference of Thursday last, I have examined Mr. Freeman's Essay on the Circumferentor, and I am clearly of opinion, that the method therein proposed for reading off the bearings to single minutes of a degree would give to that instrument all the accuracy, that can be required, and is therefore a most valuable improvement. I would however recommend a micrometer screw for more accurate adjustment of the vernier, in place of the cog-wheel mentioned in the Essay.

The

The tangent-scale applied to the sight, for ascertaining the degree of elevation or depression, has been made use of for that purpose many years ago, and is a very useful appendage to the instrument for the purposes mentioned by Mr. Freeman.

The diurnal variation of the magnetic needle has been very little taken notice of by land surveyors, the neglect of which however may sometimes introduce considerable error into the work. The first hint, that I have met with of the necessity of this variation being attended to, is to be found in a treatise on land surveying, accompanied by tables of latitude and departure, published under the patronage of the Dublin Society, about 35 years ago, by Mr. I. Hood, of Derry.

I will now take the liberty to mention a curious co-incidence of idea between Mr. Freeman and myself on this subject, having for some time past projected a similar improvement; but, as I neither executed the instrument, nor published my intentions, Mr. Freeman remains unrivalled in his claim as the original inventor.

I am with the greatest respect,

The Society's most Obedient Servant,

JAMES LYNCH.

Capel Street,

November 23, 1809.

A
L E T T E R
TO
GENERAL VALLANCEY,
VICE PRESIDENT OF THE DUBLIN SOCIETY,
&c. &c.

ON THE COMPOSITION OF BOGS.

DEAR SIR,

IN compliance with your request I send you the particulars I stated to you, when I had the pleasure of seeing you in Dublin. They were communicated to me by Mr. James Drummond, who has the care of the botanical garden belonging to the Cork Institution, and I committed them to writing in the hope they might contribute to our knowledge of the nature of bogs, which seems no less an object of the com-
mission

mission under a late Act of Parliament, than their extent.

Ballyphehane bog is about a mile and a half from the city of Cork, on the south, and contains several acres, through which a stream runs, which falls into the Douglas river. This bog has been noticed for some rare plants found on the surface of it, and is accordingly noticed in the Accounts of rare plants, by your professor of botany, Dr. Wade, and by Mr. M'Kay, published in the journals of the Dublin Society. The Institution having taken a small part for the double purpose of having bog earth at command, and of rearing some aquatic plants, for which the situation was very favourable, Mr. Drummond was led to attend to the substances found in it, and, as some of these were peculiar, he observed them more closely, and communicated to me the result of his researches. He measured the depth of the bog in different places, and found it to vary considerably. The place, from which the specimens were procured about the middle of the bog, is about ten feet in depth, and has no appearance of having been cut for turf. Here the stratum next to the grass is of black peat, about $2\frac{1}{2}$ feet in thickness; below this is another stratum of less consistence, about 18 inches in thickness, and then a stratum of the roots of chara, and other bog and water plants, which are mixed together

together indiscriminately, and pressed closely together, but seem to have undergone no change. Near the bottom are found the branches of trees, of which Mr. Drummond has found oak, elm, Scotch fir, and hazel. The bottom, in which the trees appear to have grown, is a red gravel. In some parts the depth is not more than two feet nine inches, in others, especially on the south side, it is about 20, or even 30 feet. At the deepest part, however, the depth must be inconsiderable, compared with that of many other bogs, as the situation is low, being not much above the level of Cork harbour at high water. The bog forms the division between the red-stone (an argillaceous stone which prevails through the south of Ireland) and limestone, as Mr. Drummond thinks is also the case in Kilcrea bog, and near Blarney. The limestone in all these places bears evident marks of being of the latest formation. The plants, of the roots of which specimens were sent to the Dublin Society, were *Carex paniculata*, *stricta* & *vesicaria*, *Typha latifolia*, *Arundo phragmites*, *Sparganium ramosum*, *Nymphæa alba*, *Menyanthes trifoliata*, *Melica cærulea*, and *Iris pseudacorus*. Many others grow on the surface, but these seem to contribute to the consistence of the bog. They also serve as specimens of three modes of growth,

observable in bog plants. Some grow under water, only their flowers and a few leaves rising above it. This is the case with *Nymphæa alba* and *Menyanthes trifoliata*. The roots of others, as *Typha latifolia*, *Carex vesicatoria*, and *Arundo phragmites*, creep to a great distance amongst the mud, and serve to bind it. And thirdly, the *Carex paniculata*, and *Melica cærulea*, grow in large tufts, raising themselves out of the water. When the bog has been cut, and remains so soft as not to be otherwise passable, a person may walk over it by stepping from plant to plant of the *Carex paniculata*. Whilst stood upon, the plants sink down to the surface of the water, but on the removal of the pressure regain their former position. When old, they begin to decay in the centre, and it is very common to find the *Myrica gale*, *Anthericum ossifragum*, and a variety of other plants thriving in a luxuriant state in the middle of the *Carex*, whilst it continues to spread luxuriantly at the outside. *Melica cærulea* seldom grows in the water, but grows luxuriantly on the ridges, which are left in the bog for the convenience of carrying out the turf when dried. In some places, where these ridges were originally two feet wide, they are now four, from the accumulation of the roots of the *Melica*. It is evident, that these substances in different stages contribute to the growth of
of

of the bog, and the mere inspection of the roots will satisfy every one, that they are admirably fitted for such a purpose. From the great quantity of *Nymphaea alba*, found in every part of Ballyphehane bog, it may be inferred, according to Dr. Rennie, that the bottom is firm, which agrees with Mr. Drummond's observation, that it is red gravel. The circumstance, which strikes me as most remarkable, and which I do not find mentioned in what has yet been published of Dr. Rennie's valuable work, is the stratum, or rather the various strata of stringy or capillary roots, pressed closely together, but in every other respect unchanged, yet lying under strata of tolerably compact black bog. This is probably the kind of turf, called *old wive's tow*, mentioned by Dr. King in an essay published in the *Natural History of Ireland*, though it does not exactly answer to the description there given. If peat be the product of a peculiar fermentation, to what cause are we to attribute such an unchanged mass of vegetable strings, excluded from air, and exposed to moisture, whilst the superincumbent matter has undergone the change? As the collection of facts on this subject is important, and as the gentlemen, engaged in surveying the extensive bog of Allen, must have peculiar opportunities of ascertaining what the strata of bogs usually

ally are, I would humbly submit the propriety of applying for this information. By comparing the strata of different bogs, we may be able to form a more correct judgment of their nature, and of the manner in which they grow ; and how far a different mode of treatment may be necessary in any attempts to reclaim them. There is another circumstance connected with bogs, which, I believe, I mentioned to you. Mr. Fitzgerald, of this city, who surveyed a large tract of land, including much bog, the estate of Lord Cork, in the north-western part of this county, on examining some fir taken out of the bog, found within the bark a white substance, somewhat of the consistence of tallow, on boiling which he procured an apparently pure resin. I have not been able to meet with any account of such a substance being found secreted in the fir procured from bogs ; it may not, however, be uncommon.

I have now, Sir, complied with your request in the best manner I am able. I regret, that the information I have procured is so scanty, but if I should be instrumental in drawing attention to the subject in this country, and inducing others to state the facts they have observed, I shall rejoice in having sent what otherwise scarcely deserves notice, and would at least have been withheld,

held, until I had been able to examine bogs of more extent, and greater depth, than that of Ballyphehane.

I am, dear Sir, with great respect,

Your obedient humble servant,

THOMAS D. HINCKS,

Lecturer and Secretary to the Cork Institution.

Cork, 24th March, 1810.

EXTRACTS
FROM
LASIUS'S OBSERVATIONS
ON THE
HARTZ MOUNTAINS.

FROM THE GERMAN ORIGINAL.

Continued from Vol. V. p. 410.

SECTION IV.

CHAPTER III.

Of the most remarkable caverns in the calcareous range.

THESE caverns are never found quite at the foot of the mountains, but almost always at no great depth under their highest points.

They are probably nothing else than void spaces, that formerly contained soft calcareous earth, not as yet hardened into stone, which, as might have easily happened, has been washed away by water; along with which may readily

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have

have been carried off the materials, which had served to cement and keep together the great masses of rocks, whence would follow the tumbling down of the summits of the mountain. Wherever in this fall a large piece of rock inclined towards another, which prevented the total overthrow, the cavities so made, being afterwards covered up, produced these caverns. But, where the fragments of rocks did not incline to each other, or were too weak to resist the weight of the falling ones, the whole tumbled down, and caused on the surface of the earth the deep pits, known by the name of *earth-falls* (erdfälle) which we so frequently find in the calcareous flötz ranges.

Among these caverns that, which is called *Baumann's hole*, near Rübeland in the territory of Blankenburg, merits the first consideration. It lies in the black marble range, interwoven at times with coral plants, specimen, No. 88, about 40 toises higher up than the river Bode, on the north side; and thence the mountain rises about 20 toises more. The cavern stretches in nearly the 10th and 11th hour towards the north, and the entrance to it is rather wide.

That it has not existed from the first formation of this calcareous range, appears from the wild rocks precipitated upon each other, between which various cavities are to be found. They are so united together by stalactites, that
they

they look as if they had grown together, and form a very strong arch.

The caverns, which, on account of their frightful and rough points, have not been entirely penetrated into, and probably never will, are connected together in a most wonderful manner. Curious persons usually visit only five of them, which are united with each other, this way and that way, above and below; and who can go through them without a holy shuddering! A solemn silence of death reigns in these lofty and extensive vaults, where no sound is heard, save that occasioned by the falling water-drops. Every tone emitted by a visitor is accompanied with a wide, hollow, and dull echo. What thoughts must engage a man's mind, when he reflects that he is moving under fragments of dissolution, near abysses, under rocks threatening to fall, and over abysses, covered only with precipitated masses of rocks, and that he is crawling under coral banks, where thousands of years ago rolled the billows of the ocean.

The edges of the large marble blocks are all somewhat rounded, owing to the dissolving power of the dropping water. For, where water and dampness are close upon all the edges of the marble, and in other places are constantly rendering compact the dissolved limestone in the form of concretions or stalactites, a sharp-edged

fragment may soon be rounded even into a ball, without having changed its position.* Almost every part is covered over with calcareous concretions or stalactites, which in places, where the water has flown down along the vertical or inclined surfaces, have the appearance of waves beginning to curl; but they often form all sorts of grotesque figures. The most remarkable stalactite is an insulated pillar about a toise high and six inches in diameter, which was originally generated from above, as a stalactite, by the calcareous dropping water. From the bottom below the calcareous earth contained in the water, that had dropped down, gathered and raised itself likewise into a stalactite, and thus both met in the middle and united themselves into a pillar. When struck with a hammer, it clinks like a large bell; which shews that it must be very compact and firm, as appears also from some pieces of it, that have been broken off. It is sparry, somewhat transparent, and often perfectly white in the fracture, but in some places overlaid with a yellowish brown dirty covering, which must proceed from impure water drops. This brown

* This may happen also in the firm rock, as it often appears from such bare granite stones as the, so called, hopsacks, woolsacks, &c. Accordingly we are not to believe, that every thing, which is too easily called *boulder*, has been rounded by rolling in water.

covering is often in its turn covered with white stalactite, whence, on breaking such stalactites, we frequently find various rings.

The wetter the weather, the greater the dropping of water in Baumann's hole. The earth lying above is like a sponge, which can collect water for months, to convey it gradually through the narrow passages of the cavern; how easily, therefore, can the dropping water be polluted by the impure surface water? The nearer the surface, the more frequent the dropping, and there we often find a somewhat calcareous *guhr* (gypsum terreum). In some places at the bottom the stalactite occurs also in the form of separate grains or cakes, like what is called the stone comfit of Tivoli (*confetto di Tivoli*).

It may seem singular, that the stalactites are white, whereas the marble, from whose dissolution they are formed, is for the greatest part black. But, whereas the black colour of the marble, which entirely disappears on calcination, most probably proceeds from the bitumen mixed with it, which, on rubbing the marble or striking it hard, is perceived by a smell like that of stink-stone, although rather weak, there is nothing more natural than that the dropping water could more easily draw to itself the pure calcareous earth, with which it has greater affinity, than the bitumen, which is quite heterogeneous;
accordingly

accordingly these stalactites must retain the natural colour of the pure calcareous earth. In the black marble quarry at Burgberg, opposite Baumann's hole, there has been discovered a similar stalactite cavern, which, it is said, extends 50 toises into the mountain.

In the stalactite of Baumann's hole, but never in the blackish marble, are found calcined bones of animals; this is the case also in the Scharzfeld cavern. In the particular section on organized substances I shall treat more largely of the bones of animals. On the stalactite with bones, and likewise coals from wood, see the writings of the Society of Naturalists at Berlin, Vol. V. page 217. In my opinion these coals are merely the remains of fires, which were probably lighted in old times by labourers in the cavern, that were employed in removing some impediments, which rendered the examination of it difficult to the many strangers, who used to visit it. I know for certain, that a private person once made use of gunpowder, more easily to detach a quantity of bones and teeth from the broken rocks. The labourers generally made a fire every time they had to work in these cavities, were it merely for the purpose of lighting their tobacco pipes. The coals remaining after these fires, and the splinters of the bones struck off from the stones, were again flowed over by the dropping water, and

and, by means of the calcareous earth thence deposited, were united into firm masses, in broken parts of which this phenomenon is observed.*

I now proceed to the second remarkable cavern of the calcareous range of the Hartz, viz. to that of Scharzfeld, called the *Unicorn's hole*. One descends into this zoolithe cavern, through an almost perpendicular opening, by steps cut in the rock. The passage having been widened, in consequence of a large rock having fallen off, is much narrower above than below. It stretches to the northward, and is said to extend 8000 feet into the mountain.

As the substance (*gebirgart*) in which this cavern lies, see specimen, No. 81, does not contain as much limestone as the marble rocks of Baumann's hole, that consist entirely of limestone, it is not to be wondered at, that its stalac-

* Mr. Von Trebra has been so good as to communicate to me his thoughts on this subject. He threw out a conjecture, that these coals might probably have been real bones of animals, having thus written: "I have a piece of stalactited marble from Baumann's hole, in which are fragments of weak bones, about as thick as a swan's quill, quite black, perfectly burned like a coal, and near them are bones somewhat larger, which are all white. I have placed some fragments of the black bones on burning coals, by which means they became white again."

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tites never form as long points as those of the other. The sides are merely overlaid with what is called rindstone (*rindensteine*), and only here and there are found large flat round pieces of stalactite at the bottom, which are generally covered with fine loose earth of a calcareous animal sort, that sometimes forms small hillocks. Out of this earth are dug bones of animals. I shall treat of them in the following section.

There are several others of these caverns in the calcareous range of the Hartz, ex. c. near Grund, in which we meet with stalactite, and crystallized calcareous spar, and also crystallized calcareous concretions (*kalchsinter*); but the greatest part of these caverns have been formed in consequence of persons having extracted from this part of the mountain the ironstone found there in nodules, and which brought along with it, as a sort of vein (*gangart*), the calcareous and remarkably beautiful black spar in various noble crystallizations.

I shall omit a closer description of the caverns, that occur in the flötz range, whereas what has been hitherto said concerning the rocky caverns is applicable also to them.

They lie for the greatest part in gypsum, and are nearly in the same state as those in the simple calcareous range, except that we find in them no stalactites, but only here and there some gypsum spar (*gypsspath*).

SECTION

SECTION V.

Of the petrifications and traces of organized substances, which are found in and on the vein mountains (ganggebirgen) of the Hartz, as likewise in the simple calcareous mountains.

I HAVE already in treating of each sort of mountain substance (*gebirgart*) indicated, whether and what traces of substances formerly organized, both of the animal and vegetable kingdoms, are found in them; but I shall now bring them together for the purpose of enlarging somewhat more on one or the other subject.

Mineralogy had been long cultivated before the characteristic features of the simple argillaceous or vein mountains were discovered, and also the peculiarity of traces of organized substances being contained in them; but at last it was agreed on, that they might be found at the surface, but not at any considerable depth: at present, however, we have by experience many additional proofs to the contrary, and in the very Hartz undeniable arguments have occurred to demonstrate, that such traces can be found at a great depth, although but seldom. In the deep mine Johannes, at Clausthal, madrepores have been found in the grey wacke 200 toises
under

under the surface. In the excellent and instructive collection of Mr. Von Trebra are found, among other curiosities, fragments of unknown large sedge-leaves, which on their surface bear a somewhat stonecoal appearance; also an impression of a fructification of seed (*saamenfrucht*;) a reed-stalk channeled round, and divided into joints; a twig of the *Calla palustris*, which still plainly retains a part of the root, in the grey wacke. There are likewise ortoceratites and cornua Ammonis, which are become pyrites, from the Wolfenbüttel mine at Zellerfeld.

In the collection of Mr. Steltzner, and in the not less instructive one of Mr. Ilseman at Clausthal, there occur undeniable proofs, that even in the depths of the vein mountains (*ganggebirge*) of the Hartz are to be found remains of substances once organized, and that this range of mountains must have probably arisen from the bottom of the sea. I myself have a petrified nautilus in red jasper from the ironstone mine near Elbingerode; and the coral branch, that I found in the grey wacke between Wildemann and Lauthental (see Section III. chap. 3.) furnishes an additional argument.

I very much wished, that in each collection of specimens I could have given a more accurate and better one than the imperfect specimen, No. 21. But it must be recollected that such curiosities,

sities, as those now mentioned, are exceedingly rare. All these sorts occur singly, deep in the mountains; but all the following ones lie more together in families, and proceed, with their strata and layers, in various directions towards the surface. Thus the two layers of shells, that lie almost horizontally on the rather high point of the Rammelsberg, proceed to the surface towards the north, incline somewhat to the south, and seem to widen considerably, where in the Birkenenthal, on the Malnberg, and over Julius hut, madrepores are found in the schistus. Between the shells of the Rammelsberg sometimes are found sulphur pyrites, copper pyrites, galena, and blende, sprinkled through them and even crossing the stone in fine threads.

The impressions usually found here are of entrochites, and principally of divers varieties of hysterochites, but which do not, like those from the Schalk, run into such long points, but into scales (*schaalen*) somewhat blunt and as if curved, and are also much shorter. There are likewise impressions of comb-muscles (*kammuscheln*) and chamites (*chamiten*), and at times broad crooked muscles, which are very like the *Solen culter*. But we find no where any trace of the natural scales of these muscles, as are not unusually found in the stratified mountains; there is nothing but stone-kernels (*steinkerne*) and impressions,
between

between which those scales have been destroyed, so that between the stone-kernel and the impression there is an empty space, which accurately determines the thickness of the former muscle scales. But whereas every shell of all sorts of shellfish is differently formed on the outside from what it is inside, accordingly, on the destruction of the muscles, the stone-kernels and impressions, or rather the internal and external impressions of the destroyed muscles must necessarily be very different from each other. It is worthy of remark, that entrochites are sometimes found lying on the stone-kernels of hystero-lites.

These substances are found likewise in the Schalk, but with the already observed distinguishing marks of hystero-lites, whereby they can be always distinguished from those of the Rammelsberg. In both places we sometimes find, in the disintegrated stone, very plain fungites or coral fungi, *madrepora*, *turbinata*, *fus-tigata*, &c. In their present state they are likewise of a calcareous nature, and, when not too much decomposed, strongly effervesce with nitrous acid, by which also they are discovered in the undecomposed stone, when the eye cannot distinguish them from the natural stone, which bears the same colour with them and often gives sparks with steel.

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I now pass to the very remarkable remains of a substance formerly organized, I mean, to what are called screw-stones, which have been found in the Hüttenröd forest and in Kuhbach iron-stone-mine at Rübeland, and also, as great rarities, in the sandstone of the Kahlenberg and Krohnsfeld. In the former place they are found as layers, or rather in a quartzous and jasper-sort kind of vein of the ironstone vein, that courses between the schistose and calcareous ranges. The screws themselves are of a quartzous nature, but yet often in a state, in which they are near their total dissolution. From the specimen, No. 95, it will be seen, that these bear a great likeness to a screw; but upon more accurate consideration it will appear, that the word *screw* must not in this case be taken in its most precise sense. For the, so called, cutting screw-veins (*schraubengänge*) form no serpentine line around a cylinder, but are all parallel pieces mostly round, and sometimes oval, which sometimes form a right angle with the axis of the cylinder, and are sometimes placed obliquely. Each piece, which is very seldom more than six Parisian lines in diameter, form on both its surfaces a *glorie*, the rays of which run out sharp from the centre. The cylinder, on which these pieces rest, is often scarcely half a line in thickness, but at times somewhat thicker, and

often composed of five parallel thin cylinders standing very close to each other, which in their points of contact run one into another, so that the cylinder, on its being broken, forms a pentagon star, round which the piece of the, so called, screw-vein forms a *glorie*; sometimes the pieces themselves present a pentagon appearance.

Two pieces are often found near each other, as if in pairs, so that ex. c. the space between these two pieces is somewhat greater than that between the following ones, and so it goes on alternately. The length of the screws is very various; I have never seen any of them more than an inch and a half long; they usually rest in cylindrical holes, quite disengaged all around, and are fastened to the stone only by the two ends of the cylinder. In the screws, that are not too much broken and decomposed, the greatest space between the pieces and the cylindrical holes or mantles (if I may be allowed to call them so) is the fourth part of their diameter: the more the pieces are broken, the greater consequently is the space between the mantle and the pieces, which are often so much broken, that we sometimes find but very weak or no traces at all of these pieces on the cylinder, or stalk, or spindle (call it as you will); and sometimes the whole is reduced to dust.

dust. Yet the basis, on which the cylinder stands, or has stood, always retains the circular impression of a *glorie*, which is nearly as large as the inner diameter of the mantle. This mantle has usually, within, a weak and dull impression of the pieces corresponding to it, so that one can plainly see, that between what is called the screw and the matrix stone (*muttergestein*) which forms the mantle around it, something must have been lost, which was more soluble in acids than the quartzous matrix stone and the screw, which is homogeneous with it.

The number of these pieces, that rest on a one-inch long cylinder, is not the same. I have often found, that a screw of half an inch in diameter had fifteen pieces on a length of one inch, whilst another of three lines in diameter could reckon as many; in general it may be laid down as a rule, that the number of pieces, on the length of an inch, is in the proportion of four to three, when the proportion of the screw-pieces is as one to two, that is, when two screws are each one inch long. The pieces of one will be three lines in diameter, those of the other, six; consequently the former will have sixteen pieces, and the latter twelve.

We usually find in the stone, specimen 82, impressions of suns, or *glories*, which must be taken for impressions of entrochites; but these
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are nothing else than single pieces of what is called screw-stone; for I have sometimes found screws, particularly in the Birkenthal, not far from the Ocker, so very short, that there was only one piece on the cylinder; nay, I have found some in such a state, that the sunform impressions had between them no piece at all, but merely the common narrow interval between two neighbouring pieces along with the little cylinder.

If these substances be parts of the rays of the sea-stars, for which they, as well as entrochites, and likewise screw-stones, are held by some persons, it is still very remarkable, that in the stone, No. 99, which, besides some cha-mites and terebratulites, consists almost entirely of entrochites, there are no real screw-stones; a close affinity is easily perceived between them, and, as a quantity of screw-stones has passed through my hands, I have been able to compare them several times with entrochites. A mere accident has thrown in my way a couple of specimens of the undecomposed and unbroken stone, in which the, so called, screws are usually found. To my great satisfaction I discovered from them, that the little holes, which are usually found in this quartzous stone after disintegration, were all filled up with white calcareous spar. I observed in them a number
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of real entrochites, and among these a rather large one, the cylinder of which is half a Parisian line in diameter. It exhibits even the rings, which, when a little above treating of the so named mantle of the screw, I have called dull impressions of the pieces corresponding to them. On the application of nitrous acid, I found to my great astonishment, that in every axis (*achse*) of these calcareous sparry entrochites there was sticking such a quartzous screw as I have now described. The entrochite becomes totally dissolved in the nitrous acid, and its quartzous axis, or what is called the screw, remains uninjured.

It is then exceedingly probable, that these screws are nothing else than the stone-kernels of entrochites; but it is still a very remarkable, and almost inexplicable circumstance, that, of one and the same organized substance, one part assumes a calcareous, and another a siliceous nature, and that both parts again are enclosed in a stone of the siliceous kind. If the entrochites themselves be considered as the flesh, and their screw-form spindles as the bones, one might perhaps think, that the harder substance would be more apt to receive the fluid siliceous earth than the softer one; but, I must confess, I find such causes of doubt and uncertainty, that I must rather wonder at the phenomenon

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than say any thing about it. Every one will agree with me, that calcareous marine substances with quartzous entrails, usually enclosed in a quartzous stone, are a very remarkable and singular phenomenon.

As to the rest, the petrifications of the simple calcareous range are for the most part coral shrubs and coral sponges, zoophytes and lithophytes, madrepores and millepores, and sometimes retipores, all of which become visible only after the disintegration of the stone, or by polishing it. All the petrifications, that occur in the simple range, can be very easily distinguished from those of the flötz range, in which many of them are not to be found. I shall treat, in a separate chapter, of the petrifications of our flötz mountains.

I may now add a few words concerning the bones and teeth, which are found in Baumann's hole, and in the Unicorn hole at Scharzfeld. And first I shall say, that I fully coincide with the Jena Reviewers, year 1787, No. 175, that there are no petrified bones or teeth in the Hartz. It is true, that a person might at first be tempted to believe, that the teeth, found in the Unicorn hole, are petrified. The enamel, which is quite entire on the teeth, that have suffered but little from disintegration, renders this at first in some measure credible; but we need only break

break one of them to be convinced, that it is not stone, but bone.

The bones found in those caverns are (with the exception of the teeth, which, owing to their being of a firmer substance, could better resist destruction) for the most part broken, and it is an extraordinary circumstance to find any of them entire, so as to be able to deliver an opinion on their original form. The skull of a bear, which Counsellor Blumenbach possesses, is a real treasure as to the natural history of Baumann's hole.

On comparing divers teeth, that have been found in the Scharzfeld cavern, it appears that they belonged to no other than carnivorous animals, and most probably bears. Mr. Blumenbach, of Göttingen, likewise looks upon them as remains of bears, and similar wild beasts. They did not belong to any animal of the feline kind, whereas the fore-teeth are not pointed. Compared with those from the Muckendorf cavern in the territory of Bayreuth, they are found to be exactly of the same kind, except that the latter are in a better state of preservation, and not so much calcined. Animal recrements (*animalische erde*) cover also the bottom of the Muckendorf cavern, but are purer *there*, and less mixed with heterogeneous substances.

As to the usual question, how did these bones

get into those places, I think it is very easy to answer it, without recurring to the deluge. We should, indeed, have recourse to great revolutions and floods, were they remains of animals of hot climates, or of extinct species of animals, or if they lay in the very mass of stone. But, since after accurate researches nothing of this sort is found, and these bones appear sticking only in earth and stalactites, but never in the rocks, they must be considered as nothing else than remains of wild beasts, which formerly, when Germany was more woody, less peopled, and had fewer habitations, than at present, took up their residence in those caverns. The thing explains itself. Bears and all sorts of similar beasts of prey generally inhabit caverns; and who can tell, what multitudes of them may have died in them during the thousands of years, that those animals retained the undisturbed possession of those wildernesses? Who knows but that they fled, in great numbers, from the flötz tracts of the extensive region all around, at times of great floods, towards the Hartz, which overtopped them like an island?

SECTION

SECTION VI.

OF THE FLÖTZ MOUNTAINS, THAT SURROUND
THE FOOT OF THE HARTZ RANGE.

CHAPTER I.

*Flötz mountains and their divers layers, from
the mound-earth (dammerde) to the deadlier
of the copper-slate flötz.*

IT is unnecessary to treat of the peculiarities of flötz mountains, as they have been sufficiently described by Counsellors Lehmann* and Gerhard.† I shall, therefore, premise only what regards those, that surround the Hartz.

The North sea, and the Baltic are to the northward of the Hartz, and begin at $53^{\circ} 55'$, or 54° N. L. From these points the flötz range begins to rise, yet in such a manner, that all the waters of the Hartz flow into the North sea by the Elbe and the Weser. Accordingly whoever would wish to describe the spreading of all
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* Dr. J. G. Lehmann's *Versuch einer Geschichte von Flötzgebirgen*. Berlin, 1756.

† Gerhard's *Versuch einer Geschichte des Mineralreichs*. Berlin, 1781.

the horizontal strata as far as the simple Hartz range, should begin from the coast of the North sea; but this would be too extensive a subject for this place. I will therefore but travel directly from the N. sea to the Hartz, and there direct my principal view to the flötz layers, that spread out at the foot of that range.

The North sea and the Baltic undoubtedly covered, at a certain period, all the main land to the foot of the Carpathian mountains, the Riesen chain (in Bohemia), the Erz, or metallic mountains of Saxony, the Saalfeld and Thuringian chain, and the ridge, which stretches through Hesse as far as Bonn, through the Palatinate, and so on through Lorraine to the very Pyrennees.

Out of these waters, in like manner as the countries on the other side of the mountains now mentioned, was seen starting up the Hartz, as far as it is coloured on the map, like an island, which must have been deposited, thousands of years earlier, from a much higher body of water.

.On the way from the North sea to the Hartz the whole country is at first, for the greatest part, level sandy ground, yet not entirely without elevations, here and there somewhat argillaceous, and in some places thickly covered with turf-moor, under which there is usually clay,
which

which is covered with sand. At N. L. $52^{\circ} 30'$ near Hanover, the turf-moor ceases, and a calcareous soil (which on the way hitherto occurs only in one single spot near Lüneburg*) succeeds in its stead. Going from Hanover, somewhat farther to the south, that is, to near the Hartz, we find, indeed, more considerable sandstone ridges, which stretch out under the calcareous flötz-range, and likewise belong to the flötz class, but which must necessarily be of much longer standing than the calcareous foreland placed upon them, whereas thick strata of stone-coal, and several of them one over another, lie at its bottom, and between the sandy and calcareous ranges.

These sandstone ridges are of rather considerable extent, and surround the Hartz mountains, in some places at a greater, and in others at a smaller distance, on all sides, and are often lost under the superincumbent calcareous range, under which, unexpectedly, they often appear

* The calcareous district near Lüneburg consists for the most part of gypsum, from which flow out very abundant salt springs. In a crevice of the gypsum rock there was found, in the year 1787, a mineralogical curiosity, viz. cubical sedative-spar crystals, as hard as pebbles, which, by the bluntings of their edges and corners, form a substance of 26 sides. See Westrumb's Phys-Chem. Dissertations, Part 5, and the Transactions of the Naturalists of Berlin, vol. 9.

appear again. About five or six (German) miles to the south-west of the Hartz, (near Dransfeld) both the one and the other range has been broken through by a volcano now extinguished.

In the vicinity of the Hartz the alternation of the strata constantly becomes more frequent, and the layers are less thick, as partly at the precipices, and partly from their natural juttings out, a person can clearly perceive, so that one sees how the simple vein-range of the Hartz rises like a kernel from the scales (*schaalen*) of the flötz ridges, that surround it. More plainly we see, in mining for copper slates (*kupferschiefern*), the different flötz layers cutting each other, a very accurate description of which is given in Gerhard's History of the mineral kingdom, and in several other works.

I have not been able to render the alternation of the flötz mountain substances sufficiently visible, by means of colouring, on the map; for where one sort loses itself in some places, for, a considerable extent, under another, or under the mound-earth (*dammerde*), a clear view of it could not be given. Whatever, therefore, is flötz-range I have left white; but I have pointed out here and there the principal substances by certain marks, without accurately denoting

denoting their boundaries; and that, I think, is enough.

Of all the flötze, that stretch out nearest to the Hartz, the sandstone one is the uppermost;* and accordingly with it I shall commence the description of those, that surround the Hartz, thus proceeding from the younger flötze to the older ones. This sandstone is of various hardness, colour, and mixture. It forms, particularly in the territory of Blankenburg, entire hills, hillocks, and insulated grotesque cliffs, among which the Teufelsmauer (*Devil's wall*) at the back of the Heydelberg is singularly beautiful. It consists of a series of large broken sandstone crags hanging one upon another, which are certainly connected with the sandstone mass, that forms the hill. The wind, weather, and rain have probably stripped them of the loose covering sand, into which these same agents had by degrees reduced the rocks, so that the hardest parts alone of the sandstone masses have been able hitherto to resist their destructive power. This is probably the history of all these sandstone cliffs. I could adduce several arguments to this purpose, among which the hillocks of sand collected by the wind at the foot of

* The calcareous flötz ridge near Hanover is in reality the highest, but it is too far from the Hartz to be taken into consideration in the present description.

of cliffs, whose caverns are sometimes inhabited by men, might be sufficient.

At the foot of the Regenstein, a ruined fort, is found in the loose sand a quantity of small boulders of the siliceous kind, all of which are natives of the Hartz mountains, down to one of quartz, on which small, and for the most part crystallized, iron garnets are sprinkled, whose origin I have not been able to discover.

A brown-red ferrugineous sandstone is found in this sort of stone very abundantly in the country towards Halberstadt. And at the foot of the Regenstein, at what is called Platenberg, there are shells in the sandstone, which have been changed into calcedony, of which I will treat below in a separate chapter. Although the sandstone surrounds the whole of the Hartz, yet in no part is it found so near the vein mountains as in the district of Blankenburgh. On the south and west sides of the Hartz range it is at a greater distance from it, and, where it is nearest, is however an hour's walk distant. It first occurs, *ex. c.* at the Kiffhauser mountain, which has been accurately described by Charpentier in his Mineral Geography of the territories of Electoral Saxony, together with the petrified wood, which is found in this sandstone.

Under this huge and thick flötz of sandstone
is

is a layer of dark-grey swine-stone, which, when struck with a hammer, or rubbed against a piece of iron, or against itself, emits a disagreeable, somewhat hepatic, smell like that of horn. The specimen, No. 107, is a sample of it; its specific gravity is, 2, 744. Petrifications are but seldom found in it.

The thickness of this flötz layer is so various, that no measurement of them can be given; sometimes it forms only a thin layer, scarcely half a toise thick, through which gypsum starts out here and there in small tops or heads (*kuppen*); ex. c. between Osterode and Dorste at what is called the *Lightstone*, and in other places. But sometimes it forms, in divers varieties, entire hills, as at Scharzfeld, where it appears in close affinity with the stone, No. 84. To this sort of the varieties of swine-stone belongs the more coarse-grained, less bituminous stone, No. 108, from the foot of the Hartz range between Herzberg and Scharzfeld; specific gravity, 2, 666.

A second variety of the sorts of swine-stone is the specimen No. 109, from the sandpit near Scharzfeld; it is whitish, and, being easily friable, emits a strong smell; specific gravity, 2, 343. The friability proceeds, in my opinion, from a certain degree of disintegration; and it has often occurred to me, as if it had disengaged
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in some manner the bituminous parts, so that this specimen smells somewhat stronger than a piece broken off the solid rock at the same place. All these sorts, Nos. 81, 108, 109, 107, offer a series of the various species of swine-stone, that occur in that quarter.

The calcareous flötz, that surrounds the Hartz, and of which I am now speaking, does not in all places appear as swine-stone; but there occur some other remarkable varieties of it. In the district of Osterhagen is found a cellular limestone, which might likewise be placed among the series of the sorts of swine-stone. The irregular cells and holes of this stone are filled with what is called *Bergmilch*, (mountain milk) or *Bergmehl*, (mountain honey) mineral agaric, *calx farinacea spongiosa mollis*.*

It

* The name, *Bergmilch*, has been used in very different manners by divers mineralogists. See Wallerius's Mineral System translated (German) by Leske, Part, 1. p. 22, 23. Linnaei Regn. Min. p. 207 (*Calx gur*) and Cronstedt's Mineralogy, translated (German) by Werner, p. 16 But the substance now before us is quite different from that described by Cronstedt. I have found that, which he describes, dug out of the Schwerin Lake, and am convinced, that it is the same as that he treats of.

Another quite different sort is that, which Kirwan speaks of under the name *Lac Lunae*. He classes it under the argillaceous genus, *species 1. saturated with aerial acid*; and thus, through the want of each sort having a peculiar name, several equivocations

It is white, light, of scaly parts, sticks to the tongue, is friable to a great degree, feels very

vocations take place. Linnaeus calls it, in another place, *argillam porcellanam*, as does also Vogel. The sort now before us I have found, in some collections, denominated *terram Hopinianam sive Geranam*, and also *terram calcaream squamosam*. Gerhard calls it talc-earth (*talkerde*), of Gera; that, which I have got from Gera, is perfectly the same as the substance I am treating of. This name, however, is probably founded only on its external form; for, the description given above shows, how easily the external appearance may lead a person to take it for talc-earth. Cronstedt describes, p. 218, a talc-earth, whose external marks nearly agree with this substance; yet it seems to me, as if in Werner's additions the talc-earth was again confounded with the *farina fossilis*, No. 115, of my collection; for this is the only substance, that can be used for overlaying the paste of plaister of Paris. I do not believe that talc earth is fit for that purpose.

Hence we see, that the name, *lac montis*, bergmilch, may be applied to various substances, and has been given indiscriminately to every thing, which was seen flowing as milk-white *guhr* from the clefts of mountains, or found in that appearance at the bottom of lakes.

The *lac montis* may accordingly belong to several classes of earths, but always ought to be distinguished by adding the name of its genus. Ex. c.

1. Argillaceous *lac montis*; this must be found in every place, where there is fine white clay, which is washed out by the rain-water, that got access to it. *Argilla porcellana*. Linn.

2. Argillaceous *lac montis* saturated with aerial acid, from Halle. Kirwan. Miner. p. 80.

3. Calcareous *lac montis*, consisting of fine particles like dust, from the bottom of lakes. Cronstedt, p. 16.

4. Calcareous,

very greasy, so that it makes the skin shining, and is thereby very remarkably different from all other calcareous earths, as they make the skin rough ; it melts in water, and becomes entirely dissolved, with hasty effervescence, by means of nitrous acid. The name of *mineral sponge* (see Kirwan's Mineralogy, p. 31. German edition) seems to me the fittest for this variety of *lac montis*, or *mel montis*.

Under the calcareous substances, which on the north side of the Hartz, as an understratum of the sandstone, cover the gypsum, nowhere have I found swine-stone, or it has escaped my observation ; there is rather (besides the coarse-grained lime-stone of the Sultmerberg sometimes mixed with small pebbles, and overlaid at the
natural

4. Calcareous, scaly, glistening *lac montis*, mineral sponge. Kirwan (p. 31. Germ. Ed.) The sort, of which we have a specimen in No. 106.

5. Calcareous *lac montis*, saturated with vitriolic acid, and of a gypsous kind, *farina fossilis*. Specimen, No. 115. Cronstedt, p. 48. Wallerius, part 1, p. 28.

6. Gypsous hardened *lac montis*, which comes out with the vitriolic waters from some clefts of the Rammelsberg.

7. Calcareous *lac montis* saturated with fluor spar acid ; likewise fluor sparry *lac montis*, from the county of Marmoresch in Upper Hungary.

8. Talcose *lac montis* ; Cronstedt, p. 218.

9. *Lac montis* containing silver, from old St. George at St. Andreasberg.

natural stone rifts with stalactite or rindstone) a grey common limestone, which, except some vermiculites, contains no traces of once organized substances; this is the sort most usually used for burning. It has in the fracture a somewhat argillaceous appearance, forms a flötz layer consisting of tables, from one to two inches thick, lying one upon another, and is altogether a large flötz of from three or four to five toises in thickness. Amidst this flötz layer are found, in the tract between Heineburg and Benzingeroode, single small tables, which, perhaps improperly, are called marble; they are of a simple yet agreeable colour, ending from gold-yellow through orange in brown-red, often streaked like veins of wood, and sometimes with small, black, imperfect, dendritic figures. It agrees very nearly with the marble from Hauterive in the canton of Berne, but is never found otherwise than in small pieces.

It is still one and the same calcareous flötz, of which I am treating and describing the varieties. Under it, likewise at the north side of the Hartz, the oolithe stone finds a place. It is particularly abundant in the district of Werningerode, usually as an immediate covering over the gypsum, but is often supplanted by other calcareous layers, and especially at Benzingeroode by a marle (*leimen*) mixed with schistose

tose fragments, which there forms the covering over the gypsum. Near under the mound-earth (*dammerde*) it is somewhat greyish, but deeper down, for the most part, of a smutty brown colour, like the specimen, No. 104, which exhibits a sample of it, according as it appears in a medium between the fine-grained and coarse-grained sort, and is the most abundant in that place; specific gravity, 2, 582.*

In the quarries, where this stone occurs, I have found concave circular pieces like bowls, of from a foot to a foot and a half in diameter, in which convex lenses of the same size accurately fit. The stone has assumed this form in several layers, that lie upon each other, so that it looks as if one could raise up many of those bowls, that fit one into another. Such appearances must often occur in that tract, as they are known there by the name of cauldron, or dish-stones. Mr. Schröder† makes mention of them, and speaks of some petrifications of entire fishes,

* Mr. Kirwan calls it *Ketton-stone*, and states its specific gravity at 2, 456; it is called *Hammities*, and contains ninety per cent. of calcareous earth, and ten per cent. of argillaceous earth, so firmly united with red calx of iron as to be difficultly soluble in aqua regia; the proportion of iron is only one per cent. in this stone, and yet it sensibly colours it. The Portland-stone is said also to belong to this class.

* Description of the Brocken, p. 10.

fishes, that are met with in them, of which, however, I have found no traces.

Roe-stone is used in that district only as a bad stone for making walls, as it is but of short duration in the air, whereas the little balls, of which it consists, soon loosen and fall in upon each other. There is plenty of better limestone in the country.

Immediately under the calcareous flötz hitherto described follows gypsum, which, particularly at the south side of the Hartz, in some places rises above the calcareous range in single hillocks, but often forms entire hills, which cut off steep towards the Hartz range, and surround it there likewise as if with a wreath. They form a chain but little interrupted, four, six, ten, or even from twenty to thirty toises in height, rising up like steep cliffs. They extend from Osterode, Herzberg, &c. &c. &c. insomuch that the gypsum surrounds the whole of the Hartz. On the north side it is not nearly as thick as on the south side; but it comes closer there to the falling off of the Hartz range, and is seldom above two toises thick, but often less. At Dahle, Wiedenrode, Benzingerode, Werningerode, &c. it has been sunk into in various places, where at the *going out* (*ausgehenden*) it was covered

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with

with thin layers of calcareous and mound earth. The gypsum itself in those places is of no other use than in furnaces ; for, where the layer is not thick, no large pieces of it can be had. That, which is dug up at Wiedenrode, takes a very good polish, and, with its reddish veins, and variously coloured gypsose-sparry spots on a white ground, looks very pretty ; it is accordingly entitled to the name of alabaster.

But, whereas on the south side of the Hartz the stratum of gypsum is of such great thickness, it is natural that larger pieces of it can be had there, and that, on account of its greater hardness, it is better entitled to the name of alabaster. All sorts of statuary are made of it, particularly in the territory of Northausen ; but the thickest flötze, and the largest pieces, have not always the very beautiful varieties, which are there distinguished by certain trivial names. Of the forty sorts, of which specimens are usually procured from the statuaries, I will touch upon but a few, and those the most remarkable.

The most common of all of them, and which occurs in large blocks, is what is called cloud-stone (*wolkenstein*). It is found in the Himmelsberg, in the neighbourhood of Niedersachsen, in the county of Hohnstein, and in several other parts of that tract. No. 110, is a specimen of it ; specific gravity, 2, 235. In the

the cross fracture we see in this alabaster some blackish-brown undulating streaks, which, when the stone is polished according to the lamellar fracture (*auf dem spiegelbrüche*)*, exhibit sometimes a very pretty cloud of divers shadings, whence probably the name of cloudstone.

The second sort is a handsome white alabaster, which is quarried about Wigersdorf; it is a pity that it does not occur in large pieces. It is very fine, and even in the fracture; specific gravity 2, 555; No. 111, is a specimen of it. It is vulgarly called *handsome maiden-stone*.

The third is a red alabaster, which, on account of its little hardness, receives no polish, and properly speaking, ought not to be called alabaster. It consists of scaly parts, and is glistening in the fracture; specific gravity, 2, 286. It is found in the district of Uftrungen, whence was taken the specimen, No. 112; it is found likewise by itself among the other species of gypsum; we find it also at the west end of the gypsum chain in the district of Lasfelde and Badenhausen.

The fourth is a dark grey alabaster with black parallel streaks, of which there is an entire mountain near Steyerthal in the county of Hohnstein. It usually breaks into tables, that

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* See Transactions, 5th Vol. Note at page 331. Tr.

lie in a horizontal layer; it seldom breaks into blocks, owing to its dark grey streaks alternating with black, as may be clearly observed in the specimen, No. 113; specific gravity, 2, 335.

From the sorts of alabaster now mentioned, which are various modifications of one and the same flötz, there proceed several very different varieties, which might probably be interesting to many amateurs, to whom I can recommend no better guide than Mr. Albertus Ritter, in his Dissertation *de Alabastris Hohnsteiniensibus*. I must, however, take notice of some few rarities. And first a bright-grey alabaster deserves to be remarked, in which are found alabaster balls entirely white, up to an inch thick; the bright-grey matrix of these balls breaks rather in a table form, and the white balls are scattered through the stone without relation to its natural separations (*ablösungen*). On splitting the tables according to their natural separations, they detach themselves from one table and stick fast to another, so that almost always a segment of the ball overtops the surface of the table. I have given a specimen, No. 114, which I have cut, so that one may clearly see even the interior of the white balls. How these balls have been produced in the alabaster, or have got into it, is a question not easy to answer; for, it seems to me scarcely credible, that

that they could have forced themselves, as round boulders, into the as yet soft mass of the grey alabaster, or that they might have been produced in certain air-holes (*blasenlochern*), which, perhaps, were caused by fermentation in consequence of the calcareous earth being saturated with vitriolic acid. Yet I should be inclined to admit the latter hypothesis, until a better and more credible one shall appear. This sort of stone is found in Johannisberg near Niedersachswerfen, whence is the specimen, No. 114. It is likewise found in the district of Steyerthal.

Another and much greater rarity is found in the district of Harzungen, under the name of snake-stone (*schlangenstein*). I have a specimen of light-grey alabaster, four inches and a half long, on which a white irregular snake-line, about the twelfth part of an inch thick, runs through a length of seventeen inches. Another similar snake-line runs at the distance of half an inch, exactly parallel to the former. What can this be? Are these snake-lines the contact marks of two alabaster tables, lying one upon the other, which had an undulating surface? This does not seem credible. When on a rubbing stone a dark colour in the form of pap is made to mix with a brighter one, I have often observed similar appearances, before the mixture
was

was fully completed; the snake-lines are probably to be ascribed to a similar operation at a time, that the mass was still pappy and fluid.

I have already, when speaking of the calcareous flötz, made mention of what is called *lac montis*, agaric mineral, and likewise of the gypsose *mel caeli*, *farina fossilis*, of which, No. 115, is a specimen. As Mr. Werner had not seen it before the publication of his new translation of Cronstedt, I shall endeavour to describe its external marks. It is white—in the form of flour, that does not grate between the teeth—without any glistening particles—feels very dry and meagre—does not, even in a dry state, get into lumps, as hair-powder does to a certain degree—is so light, that it floats somewhat on water, before it falls to the bottom, where it becomes a pap—effervesces but little with the nitrous acid, which, however, disengages nothing particular from it—when burned, is remarkably fine, and of a dazzling whiteness. This substance occurs by itself in the crevices of the gypsose mountains, and most abundantly at Bischofrode in the county of Hohnstein, where in times of heavy and constant rain it flows out like milk, and is probably nothing else than dissolved gypsum-stone.

Of the remains of organized substances, found
in

in this gypsose range, I shall treat in the third chapter of this section.

On sinking into the fine copper-slate flötz, such places are, as much as possible, fixed upon, where the outgoing (*ausgehende*) of the flötz layers hitherto described is far backwards, to avoid sinking through them. As this range lies over against the Haiz chain, and rises, in many places very steep, more than 200 feet high, it is vulgarly called the *gegengebirge*, or counter-range.

This counter-range has, to the south side of the Hartz chain, as to the position of the flötz, a dip nearly parallel with the outward fall of the Hartz vein-range, and also with the inward structure of its courses; and this holds good likewise as to the succeeding flötz layers, which lie deeper down; I do not know of any exception to this rule, at least on the S. side of the Hartz. But on the N. side divers falls occur, in which the flötz layers of the natural outward roof of the Hartz vein-range, in opposite or contrary directions, and consequently rather parallel with the inward structure of the courses of the vein-range, fall from north towards south. This is the case as to the small chain of hills, which at the north side ex. c. at the Langenberg, near Drübbeck, Darlingerode, Werningerode, Benzingerode, and Heinburg, surround
the

the Hartz as if with a mound, through which the streams and rivers, flowing from the Hartz, appear to have intersected the connexion of its parts.

At the Sultmerberg, near Goslar, the layers of limestone are parallel with the fall of the Hartz range, and thence spread themselves still more downwards until they push again under other flötz layers, which have their outgoings (*ausgehendes*) at a greater distance from the Hartz.

It is also worth remarking, that much more abundant vestiges of organized substances are found in the *Gegenbirge*, or counter-range, than in the flötz layers, which are sunk into for copper-slates, and in which scarcely any thing of that kind is to be met with.

Of the flötz layers under the gypsum, which cover the copper-slate flötz, I shall treat towards the end of the second chapter; at present it will suffice to refer to the numbers there mentioned, from IV. to XIII. included.

Meanwhile I must in this place describe more particularly a limestone, which in the enumeration now alluded to is marked No. V. and is called *zechstein*. The stratum of it is usually two toises thick, but is sometimes thicker, and at its *outgoings* forms entire hills, as ex. c. near the Königshütte at Lauterberg. When
rubbed

rubbed, it emits a smell somewhat like that of swine-stone; and it is used in the iron foundry at the hut as a menstruum. Sometimes there are found in it small pieces of galena, which contain per cent. eighty parts of lead, and only half an ounce of silver; they are from one half to two inches thick; there occur also some crevices, up to four inches wide, filled with a somewhat darker limestone, as if with a sort of vein. But what renders this *zechstein* still more interesting, is the talcose mica, which is usually found in the fissures of the stone as if laid on, and rarely in nodules. No. 105 is a specimen of it. Specific gravity, 2, 708.

Passing over some other flötz layers, which have been fully described in other works, I now proceed to the copper-slate flötz. This flötz, which surrounds the whole of the Hartz mountains at their foot, and, with a few exceptions caused by particular circumstances, falls right, or, for the greatest part, has a parallel fall with that of the Hartz range, lies 705 Paris feet above the level of the Baltic. It is very seldom visible at the surface. In some steep precipices, occasioned by external circumstances, it appears at the surface; ex. c. from Lauterberg to Scharzfels the Oder flows along the foot of the Hartz, and seems to line that, which is properly the vein-range. But it is not until we ascend

ascend between the Försterhause and the Königshütte towards the steep flötz range, that we find the vein-range, upon which the dead-lier, and then the copper-slate flötz, 14 inches thick, with its superincumbent flötz layers lie near each other.

Mr. Werner, in his translation of Croustedt's Mineralogy, p. 73, has given to this flötz, or copper-slate, the name of bituminous marleslate, whereas copper and metallic parts constitute the smallest portion of it. Argilla and some calx, both intimately united by bitumen (which on the rubbing and breaking of it is perceived by the smell, and renders the copper very difficult of fusion) are the chief component parts. There are sometimes clear impressions of fishes, which are very often somewhat in the state of pyrites (*verkieset*).

In the undermost layer the slate is found, in some places, strongly impregnated with pyrites, nay, consisting entirely of it; and between the slate there occur at times threads and knots of vitrous copper. But then they are no longer called slate, but flötz mineral (*flötzerze*). See Gerhard's Gesch. des Min. R. part 1. §. 72.

Under the flötz minerals is comprehended also another sort of minerals, viz. those that appear on what are called backs or turns; these backs are constantly in the places, where the flötz assumes

sumes an altered fall or dip, and must be considered as breakages, which the flötz has been subject to in consequence of great revolutions of the earth. In these breakages the copper-slate flötz is usually of a nobler kind, and they may be called veins of the flötz range, in which a richer and finer sort of minerals, such as copper pyrites, vitrous copper, galena, cobalt, copper-nickel, and sometimes mere green or blue copper-ochre are generally found.

At the long wall near Ilefeld some of these backs or turns showed at the surface the beautiful copper pyrites, that breaks out on them, and pretty looking, but in fact very bad cobalt, which usually appeared in an ochreous form; this induced some ignorant undertakers to look upon it as the real vein lying deep below, and of the sort that is found in the vein-mountains; nor did they perceive their error until having expended much money on their works, and on the building of a smelting house. The slate was too poor in mineral, and the smelting of it would not have been worth the trouble. For, the slate is not generally of the same good kind as to the proportion of mineral; and it appears to me, that the flötz, considered on the whole, is poorest at the western foot of the Hartz mountains, and that its value encreases in proportion as it extends to the eastern extremity; for, the
richest

richest flötze are found in the county of Mansfeld, and in the territory of Eisleb. Nearer towards the west the flötz has been sunk into in several places, but, owing to the poor produce, no works were erected. This was the case, ex. c. at Herzberg, where some galena was found, which, however, could not cover the expence of a regular undertaking. Still farther to the west it has been found so poor, that it was, at best, like a bad sort of stone-coal.

In like proportion there appears a remarkable difference, as to richness, between the flötz on the south side and that on the north side of the Hartz. On the S. side the slate is constantly much richer than on the N. side, where it looks like bad stone-coal. This is not to be confounded with the real stone-coal flötz, which at Blankenburg, and many other places, is seen at the surface over the copper-slate flötz.

I shall now, in my description of the flötz range, go deeper down to where the deadlier is found with its various modifications, according to which it approaches sometimes to a breccia, and at other times (as in the territory of Ilfeld) to a fine sandstone, or a sort of porphyry, the next substance lying under the copper-slate flötz. As these substances are older than the copper-slate flötz now mentioned, together with its superincumbent layers, it will be proper to treat of them in a separate chapter.

CHAPTER

CHAPTER II.

Of the older flötz layers, that lie under the copper-slate flötz, and accordingly between it and the foot of the vein-range of the Hartz.

IN this place, what is called deadlier, is the first object of consideration, and I cannot give a better description of it, than that, which Mr. Voigt, of Weimar, has given in his Letters on Mineralogy, p. 16. These are his words: "When the primitive mountains existed still alone, and were enveloped in a troubled wild ocean, above which only some of their backs appeared like islands, the first operation of the water consisted in gnawing the adjoining parts of the mountains, the broken parts of which fell upon the bottom of them. Hence was derived the lowermost flötz layer, which we always find lying immediately upon the primitive range, and which is called *red deadlier*. It consisted of a prodigiously diversified collection of rounded stones, united together by means of a red, or sometimes a grey argillaceous substance, and the whole has acquired a considerable

able degree of hardness." It is, therefore, not to be wondered at, that in the deadliers there appears such a variety of divers sorts of stones, which, for the greatest part, belonged to the neighbouring primitive mountains; many of them, however, are parasitic, having been brought by the water from remote tracts. They are not always connected together, and sometimes lie quite loose at the foot of the primitive chain. Thus ex. c. in the district of Osterode there is a monstrous quantity of rounded boulders, of all sizes, mostly quartzous, but yet often parasitic, or heterogeneous to the Hartz mountains, lying immediately at the foot of the vein-range of the Hartz; and these are the same as the deadlier, or the undermost layer of the flötz range.

To describe all the different modifications of this deadlier would be too tedious, and very little interesting; but it must be interesting to be informed, that it forms entire mountains, which often rise with extraordinary steepness to the height of 688 Paris feet, and then proceed gently upwards as high as 772 feet over Ilfeld—that there are veins in it, and various other layers, in so much, that even a stone-coal flötz lies under them, at the bottom of which impressions of sedge and herbs are very clearly perceived. The view of the whole, given at
the

the end of this chapter, will convey a clear idea of it.

I have, on the map, distinguished the places, where porphyry occurs, by a dark-green colour; and a considerable portion of the Hartz, in the district of Ilfeld, will be found thus coloured. A very singular sort of stone is found there, which I cannot reduce to any other class than that of the porphyrites.

Probably no objection will be made to admitting the stone, No. 74, of the collection into the class of porphyrites; it is a brown-red, somewhat corneous, argillaceous stone, with some felspar and single green serpentine-like intermixtures; in it are seldom found small iron garnets, which, however, occur in specimen, No. 74, which is from Sandlitz, near Ilfeld, where it adjoins the sorts of amygdaloid, and lies upon them. Specific gravity, 2, 641.

The nearer we proceed to the flat country, the more the stone changes, and the less does it seem like porphyrite; yet one stone loses itself so much into the other, that a person is often in doubt, what he must take it for. Thus, as No. 74 is one extreme, next to the amygdaloid, so is No. 75 the other extreme, in the neighbourhood of the flat country. At first sight, the latter will certainly not be taken for porphyrite, and yet it is so nearly allied to the
other

other stone now described, that it cannot be well called by another name. It is of a brown-red colour, rough, and somewhat sandy in the fracture, and sprinkled here and there with small white points, which are probably felspar.

Mr. Westrumb has analyzed this singular stone. I here give the result of four of his different experiments, which is as correct as any analysis can be, and as might be expected from the accuracy of so great a chymist: it is contained in the following extract of a letter of his, dated June 20, 1787.

“It consists of silex, alum earth, calcareous earth, almost metallic iron, and ponderous spar-earth (*schwerspatherde*). That the iron, contained in it, is in the form of a nearly perfect metal, I conclude from the dark-green colour, which the fossil, after its heating with alkali (*laugensalzen*), communicates to the acids.”

“Whether the ponderous earth, as spar which is united with vitriolic acid, form a component part of the mineral, I dare not determine, nor can it be determined, when a person is obliged to heat a mineral before its decomposition with alkali. This much is certain, that the earths, which it contains, are void of air—it does not effervesce with acids, loses little when heated, and at most, when heated in the air apparatus, drops a little water in the fire; and, finally, the parts

parts separated by decomposition amount to much more than the mineral in its original state, and the longer and more it is heated, the greater the increase of the parts decomposed."

“Its specific gravity is 2,052.—Taking the proportion of component parts at 100—we have of siliceous earth—————parts—71

—alum earth—Do.—19

Calcareous earth void of air—Do.— 7

Calx of iron (*Eisenkalch*)—Do.— 9, 50

Ponderous spar earth————Do.— 0, 75

Total 107, 25

“ You are not surprized, that there are 7, 25 parts more than there ought to be. The earths, in consequence of the heating, received some air and water, and then the iron existed as metal, not as calx in the composition of the mineral; if this be attended to, and if we recollect that 100 grains of iron metal give 225 of iron calx, the phenomenon can be easily accounted for.”

These two sorts of stone form, in the district of Ilfeld, particularly at the Herzberg, very handsome grotesque cliffs, the like of which are no where to be met with, except at the granite mountains, or at most in the simple calcareous range of the Hartz. It is a singular and very remarkable circumstance, that they

I.

bear

bear a close resemblance with the vein mountains, in so much that there are real veins in them. There are courses in them still more perpendicular than in the simple argillaceous vein-mountains; and it would not easily occur to any one to consider them as a flötz range, did not the stone-coal flötz lying under them, at Rabenstein near Ilfeld, and at Vaterstein near Neustadt, clearly prove them to be such. Were this not the case, a person would reckon them, and also the amygdaloid and trapp lying under them, among the older classes of vein-mountain; so easy is it to err in fixing the age of mineral substances and classing them. Who would look for a coal flötz at so great a depth under the copper-slate flötz, which appears at the long wall near Ilfeld? The outgoings (*ausgehende*) of these two flötze are, with similar dips, 4500 paces from each other; the former at the long wall near Ilfeld, and the latter at the northern limit of the range over Ilfeld, coloured green, at what is called Brandes Bach. Among the varieties and divers modifications of these two substances is also the specimen, No. 78. This is a very hard argillaceous mass, of a pale peach-blossom colour, in which are sprinkled very fine small bits of felspar, which, however, being of the same colour with the stone, are scarcely visible to the naked eye. The felspar becomes
consumed

consumed by disintegration, and instead of it there remain the little holes, which it had occupied. This stone bears some likeness to the sort of porphyry, which Mr. Voigt has given in his Mineral Cabinet, No. 7. It goes by the trivial name of cotton-stone, probably on account of the single round spots, which are commonly red and have a yellowish edging, and at times are quite yellow. It is very difficult to determine its position and relative proportion; but this much is certain, that it occurs in a very close vicinity with the amygdaloid, No. 58. It is found at Ochsenplatz on the west side of the Netzberg in a small plain, surrounded with such substances as Nos. 74 and 75, and seems, at the bordering with the amygdaloid and trapp, to be a modification of No. 74; specific gravity, 2,298.

The mineral veins, that are found in the two masses No. 74 and 75, give iron for the most part, which may be easily supposed on account of the considerable proportion of iron, that the substance, No 75, certainly contains. There appear in it white-iron ore (*stahlerz*) according to Mr. Kirwan, fine red hematite, and crystallized ferruginous mica (*eisenglanz, eisenmann, eisenglimmer, eisenrahm*;) the iron is often very rich in brown-stone. The *gang* is quartz and ponderous spar; and the adjoining stone of

the veins of the Netzberg is a red jasper similar to specimen No. 32. The veins are good, while passing through the porphyritic substances, Nos. 74 and 75, and unproductive in passing through the layers of amygdaloid down to the trapp, where they become good again.

Farther on from Ilefeld towards the west there are found in the Harzeburg and Möncheberg veins of brown-stone, whose *gang* is chiefly ponderous spar. Under the range of the porphyritic stone, No. 74, is found the amygdaloid* with very different varieties, at first with

* In a note on the name, *amygdaloid*, Ladius makes some observations on Mr. Kirwan's definition of it; but, as they apply not to the second, but to the first edition of that gentleman's Mineralogy, I do not think it necessary to give them here. In the same note he makes the following remarks on zeolite. "Zeolites also might be reckoned among the admixtures of amygdaloid, did they not in the sorts of amygdaloids, that contain them, appear somewhat equivocal, and often must be considered as volcanic substances. We see indeed from the Hartz mountains, that zeolite can be formed without volcanoes; therefore we are not positively to reckon among the volcanic productions the amygdaloids, which contain zeolite. Where the amygdaloid forms whole mountains in the Palatinate and Dutchy of Deux Ponts, it is, as well as that of the Hartz, not to be reckoned among the volcanic productions, but, like that and the amygdaloid of Derbyshire, among the flötze placed on the older vein-mountains. Yet in those districts of the Palatinate I have found the amygdaloid broken through by volcanoes in different places, in which similar sorts of amygdaloid are found among the lavas. But this is a matter of mere circumstances." *Tr.*

with weak indications, but which, as one goes farther down, become still clearer. The uppermost layer of it consists of an argillaceous sort of stone, with small, and often scarcely perceptible holes, which are generally either filled within with green earth of the serpentine kind, or have it scattered near them. At the surface it is very much disintegrated, as appears from the specimen, No. 59; it is often very ferrugineous, and is intersected by veins of ferrugineous spar (*eisenspath*). This circumstance, and the little greenness have given occasion to make some attempts at smelting it in the Electorate of Treves, where also it is found; but only a very impure and mixed metal, which for the most part is iron, has been obtained. No. 58 is an undecomposed specimen of this stone: it is from the Ochsenplatz at the west side of the Netzberg, and its specific gravity is 2,598; in this specimen the air-holes are still more plainly recognized. The deeper down, the larger these air-holes, in which are sometimes found small kidney-form lumps of calcareous spar with serpentine, and likewise some small balls of calcedony, which Wallerius calls *swallow-stones*. No. 57 is a specimen of it; it is from the Netzberg about Ilefeld; specific gravity, 2,632. When the air has destroyed the small kidney-form bits of calcareous spar, this stone acquires the fallacious appearance of a porous lava.

Still

Still deeper down the air-holes are proportionably larger, and a greater quantity of calcedony and agate appears in them, but yet in rather undetermined forms, ex. c. longish, rounded, flat little pieces, such as the specimen, No. 6.

Then follows a brown liver-colour trapp, which, on account of the regular balls of agate, &c. occurring in it, belongs likewise to the amygdaloids. It forms in the Netzberg a layer about half a toise thick, which lies under the beforementioned one. No. 54 is a specimen of it, in which is a ball of agate.

Farther down, deep towards the bottom, this stone loses itself gradually into a black, or black-grey trapp, likewise amygdaloid, No. 52, which in some single blocks assumes a greyish-green colour; for instance, No. 53. In these the almond-form mixtures are somewhat rarer than in No. 54, and the agates are seldom so beautifully marked, generally consisting only of calcedony, together with which we sometimes find also calcareous spar. There occurs, yet very seldom, in irregular nodules a glassy, and sometimes coloured fat quartz. At a greater depth, all these mixtures gradually disappear; the name, *amygdaloid*, is no longer applicable, and there remains at length merely pure trapp, which is visible at the Rabenstein, &c. Veins
of

of iron, the iron-stone of which is usually accompanied with brown-stone, are found in this trapp, but they are not worked at present.

I now proceed to a closer description of the agate balls themselves, which, specimen No. 55, are found detached, and shall venture to throw out some thoughts concerning their origin.

In the first place, the form of the balls is extremely remarkable; the term *ball* is, properly speaking, an incorrect name for them, but I have hitherto retained it, as it is the most usual. On examining the specimen, No. 55, it will be found, that it comes nearer to the form of an almond, whence may have been derived the name, *almond-stone*, or *amygdaloid*. But these substances vary somewhat in form from an almond; for almonds are always pointed at one end; but the agates are sharpened in the form of a wedge, like the blade of a razor.* The sharp

* Although I have no idea of comparing, and much less of placing the two substances in one class, yet I cannot help quoting a passage, which greatly struck me, from the Miscellaneous Contributions to Physical Geography, part 1. cap. 3. p. 86, Brandenburg near Halle, 1774. It is this; "At some distance from Currure, in the East Indies, is the diamond mine of Lattewar, in which the diamonds are found in a reddish earth, that are often like the blade of a razor, being thick on one side, and quite thin on the other."

sharp end of such an agate-almond is, in its position, always turned, more or less, downwards. The more the longest diameter of such an almond recedes from the vertical line, the flatter do they appear to be pressed down by the superincumbent mountain, so that they lose almost entirely that form, when, as in the case of specimen, No. 56, they come near to the horizontal position, or actually lie in that position. Some few occur, which, according to their longest diameter, are in a full perpendicular position; but they are of the form of a pear, with their points turned downwards.

Now supposing, that heat joined with moisture, and the consequent fermentation had disengaged some sorts of air from the as yet soft mass of the stone, and that these were collected into air-bubbles, which, on account of the density of the fluid mass, could not ascend according to the shortest line of resistance, and burst in the open air, there is nothing more natural than that these air-bubbles should be in the lower part pointed or sharpened, and in the upper round or arched. For, the tendency of the air in a heavy substance, to ascend by the shortest line of resistance produced for itself, according to this direction, in the part of the mass still soft like paste, at the time of its deposition from the water, a sort of arch, which on the
subsequent

subsequent hardening of the mass remained, and kept that form. But, whereas the shortest line of resistance in a mountain very seldom coincides with the perpendicular line, it necessarily followed that, in case of an oblique shortest line of resistance, the perpendicular pressure of the superincumbent range should flatten the air-bubbles on one side, and that, in case of the coincidence of the shortest line of resistance with the horizontal line, they should be quite flattened. The former case may be observed in the agate-ball, No. 55 ; the longest diameter extends from the sharpened end to the roundish one, as likewise the shortest line of resistance, yet so, that the sharpening runs horizontally. The latter case occurs in No. 56, in which the shortest line of resistance coincides with the horizontal line, so that the agates, which are found in it, are quite flattened like small longish cakes.

After the air had formed for itself these air-holes, the wet substances occurring in the mountain would naturally be collected in the adjoining cavities ; these were impregnated with acids, and heterogeneous sorts of air, and thereby acquired the power of separating the finer earthy parts from the neighbouring rock.

In proportion to the facility, or difficulty, with which these earthy parts were dissolved, they

they must have afterwards become hard again, and partly crystallized. Thus, for instance, the calcareous earth is that among all sorts of earth, which is most easily and quickly dissolved; consequently it will be the last, after the separation of several sorts of earth, to harden again, to approximate its parts, or, if there be room enough, to crystallize. On this account we sometimes find in hollow agate-balls beautiful crystals of calcareous spar lying on quartz; these crystals are not always of mere calcareous spar, for I have, although very seldom, found some of them to be of ponderous and fluor spar. The calcareous earth of an impure sort, and too closely allied and connected with the earthy parts of the substance of the rock (*gebirgart*), and sometimes ferruginous, has firmly fixed itself, in various manners, to the sides of the bubble-form holes, so that the agates are sometimes covered with a calcareous crust, and accordingly at the surface effervesce with acids. There are sometimes found balls, consisting entirely of calcareous matter, which, when dissolved in a sufficient quantity, had filled up the whole cavity.

After the dissolution of the calcareous earth, that of the pure siliceous earth came on in its turn, in the course of time. But, as it does not dissolve so easily as the calcareous earth, it must accordingly sooner become hard or crystallized.

Therefore

Therefore in hollow agate balls the quartz is always found between the real agate and the calcareous spar, or, if there be no calcareous matter, always inside. Sometimes balls are found consisting merely of quartz, which, having been dissolved in sufficient quantity, had filled the entire cavity; when in a smaller quantity, it left the ball hollow, and merely lined the cavities with quartz crystals, which, according as the siliceous earth was more or less impregnated with ironstone, or brownstone, are variously coloured, brown, red, or violet.

The water, from which the siliceous and calcareous earths had been separated by crystallization, must have remained behind in the hollow balls; and on breaking these balls, if as yet undecomposed and uninjured, we actually find it in them.*

Although in this place there can be no discussion about the solubility of argillaceous earth in acids, yet the fine argillaceous earth can be easily united with every watery fluidity, and by their mixture the solubility of the siliceous earth, so nearly allied to it, be prevented, and, viceversa, the more speedy hardening of the siliceous earth be forwarded. This is plainly seen
in

* In this manner we can account for the calcedonies with water drops from the Vicentine hills.

in the balls we are now treating of; their external coat is usually of the calcedony kind, or, more properly speaking, a hardened siliceous earth closely mixed with argill, which, also on account of its near affinity with the argillaceous substance of trapp, has uniformly attached itself to it on all sides, and thus hardened in concentric scales. If there was no more argillaceous earth in the solution, which might change the quartz into calcedony, and bring about the more speedy hardening of the siliceous earth, and if this had fixed it firmly all around, the pure siliceous and calcareous earth, separated from the argill, remained behind in a state of solution; it continued in the fluid state, until the time came that it could harden by itself, and crystallize. During this interval, the siliceous earth, now become calcedony, mixed with argill and some calcareous matter, was in a more slimy and gelatinous state than the more pure solution of the siliceous earth. The gelatinous mass of calcedony, which all around in the cavity either was uniformly distributed, or received affluxes from the mountain above, sometimes sank down from above in stalactites; and therefore we sometimes find in the balls stillicidious (*getropften*) calcedony, either insulated, or again coated around with quartz, so that it cannot be discovered in the agate balls, except by a polishing

a polishing parallel with the direction of the stalactites. But where the slimy mass of calcedony was not in sufficient quantity, so as to trickle down in virtue of its own weight, and flow down along the sides, it remained hanging in half-formed drops at the arch of the balls, and hence proceeded the kidney-form figure of the calcedony; perhaps also a certain greater degree of fatness (if I may be allowed to use this word by way of comparison) was the cause of it, owing to which the slimy mass of calcedony could not mix with the more watery fluidity, that still remained in the solution, and a resistance to their uniting took place in the same manner, as we observe on dropping some odd drops of oil into a glass of water. For this reason the quartz, which afterwards became deposited in the kidney form calcedony, is never found so intimately connected with it, but that (particularly after a certain degree of disintegration) it can be separated from it by breaking.

According to what has been stated, the gradations of solution are, 1. Calcareous matter. 2. Quartz. 3. Calcedony: and those of hardening and crystallization are, 1. Calcedony. 2. Quartz, and 3. Calcareous matter.

Serpentine, or Magnesia earth (*Bittersalzerde*), when occurring in the mixture only in a very small quantity, colours merely the outward

ward coat of the ball, and the cavity in which it rested, somewhat green; but it is usually and preferably attached to such balls as consist entirely of calcedony, and in which there is the least admixture of calcareous matter; seldom is it found spread out in greater abundance, as colours use to be spread; I have never observed it in such quantity as to fill one of these cavities by itself.

Sometimes the cavities are entirely, and sometimes only in part, filled with coarse hardened argillaceous earth, exactly of the same sort as the trapp substance, No. 54, in which they are found; and the modes of filling are exceedingly various, according as the wet substances in the air-holes had dissolved, and again deposited, one or other simple earth in a greater or smaller quantity. Thus, for instance, there are balls, in which nothing else is found all through than calcedony, which, when coloured by metallic substances, receives the name of agate; likewise balls are met with, in which calcareous matter is prevalent, and calcedony occurs in a very irregular manner, and as if in nodules.

If there existed in the substance of the rock (*gebirgart*) also metallic parts, they must have been equally brought into a state of solution, when the water collected in the cavities, now containing the agate balls, had separated the
finer

finer simple earths from the mineral, and, I may say, lixivated them.

In proportion with the more or less phlogistic, or dephlogisticated state, and the consequent greater or lesser solubility of the metallic parts, (which in this case are only ironstone and brownstone) their hardening and crystallization must have succeeded in a suitable series, and accordingly the separation of the metallic parts from the sorts of earth have gone on, in the same manner as, according to the above disquisition on the origin of agates, the calcareous and siliceous earths separate in proportion to their respective solubility.

For example, if the metallic parts were less soluble than the calcareous matter, and more so than the quartz, we must at present, on breaking the agate balls, necessarily find the metallic aggregate hardened between the calcareous matter and the quartz; and thus in almost every agate ball we may observe the gradations of the various solubility of substances.

In the agate balls at Ilfeld, the metallic admixtures are found only in the form of nodules, or kidneys, and sometimes crystallized, but in such regular and concentric scales, as the agate itself. I have found iron in them under different appearances; one time as iron-spar (*eisenspath*), another as scaly iron-ore (*eisenrath*), another

as

as white iron-ore (*stahlerz*), another as *eisenmann*, or crystallized iron glance (*eisenglanz*). I have also discovered in them real radiating hematite, which usually appears only at the surface of the agate balls, and sometimes merely as the track of them ; then are seen small, round, brown-red points, from the size of a lentil to that of a pea, which usually consist of concentric rings. On breaking the stone, these red points often rise out from the agate balls, and one can plainly see, that they are nothing else than impressed half-balls of a red hematite.

There are sometimes found in the trapp range some small clefts, of the width of one or two lines, which are filled with calcedony substance, and have streaks of onyx. I have seen a similar cleft passing through an agate ball. The calcedony seemed to have again connected it together, after, perhaps on a splitting of the rock, it had been broken along with it. That the rock had been split in several places, appeared from divers agate balls still fast sticking in the mountain, and divided by rock-clefts ; but of these balls the one half was not placed exactly towards the other, but was constantly, with respect to it, somewhat sunk and pushed out of its place.

The agate balls stick very fast in the undecomposed trapp ; but, as soon as the stone gets somewhat

somewhat into a state of disintegration, they can be easily separated. The ferruginous trapp, No.54, is very apt to become decomposed, and the stone is, in its small and often scarcely visible clefts, very easily penetrated by corrosive wet substances. These attack also the agate balls sticking in the stone, which, if consisting merely of calcareous spar, are soon destroyed, so that, on breaking the somewhat decomposed trapp rocks, holes are found often quite empty, in which but seldom a little ochreous earth occurs. The balls, which, besides calcareous spar, contain also nodules of calcedony, can lose, by disintegration, only the calcareous spar, while the calcedony, in virtue of its greater power of resistance, remains entire. Hence it is, that in those cavities we often find only fragments of calcedony balls.

Such a flötz, as that of amygdaloid now described, must necessarily appear at the surface in many places ; this, however, is a mere chance, when it is perceived in a virgin mountain covered in many places with mound-earth (*damm-erde*). Nor is it to be wondered at, that it shows itself, in places considerably far asunder, under various modifications ; one may, notwithstanding, always conclude with a certain degree of probability, that he has found again the same flötz, when in one and the same range there ap-
M pears

pears a similar flötz under similar circumstances, although it be somewhat variously modified. This is the case with regard to the agate flötz, which appears at the surface between Walkenried and Weida, under the Langenberg, nearly over the bank of the river Weide.

The Langenberg is a flat hill consisting of a brown sandstone, which, in the general view of the flötz layers at the end of this chapter, is marked the 17th; in the upper part the sandstone becomes more argillaceous, so as to correspond with the 16th flötz-layer; of the 18th, or the stone, Nos. 74 and 75, we find there no trace. Under the brown sandstone is found likewise the agate flötz, not like the amygdaloid of the Netzberg, but as a white clay about three feet thick, of which No. 46 is a specimen. Might not this clay be a decomposed amygdaloid, such as we see in specimen No. 59? I think this amygdaloid wants no considerably greater degree of decomposition to become the white clay, No. 46. In this white clay are found the large balls, or rather nodules of agate from Walkenried.

These large nodules consist of a mixture of quartz, calcedony, and agate, through which sometimes pass brown and red veins of jasper. The opaque, from one to two inches thick, external coats of these large lumps are usually of
a peach-

a peach-blossom colour; but on closer examination they are found to consist of fine red and white fibres alternating with each other, which all tend towards the centre of the lump. Within is seen quartz, surrounded with a coat of calcedony, and both are intersected by veins of agate and jasper, which seem to have filled up their clefts. Nature must have had in view wonderful alterations as to these lumps, whereas we find throughout traces of separation and regeneration, which it is not possible to observe in the small stones struck off from them, specimen, No. 45.

There is a tradition, that a flötz of stone-coal has been discovered in that place under the white clay by means of a shaft, the remains of which are still visible; this appears to me very credible, from the position of the stone-coal flötz under the amygdaloid near Ilfeld, whence we may conjecture there is one in this place also. I must here mention a very rare crystallization, which has been found only once in these large nodules of agate, and from which a very beautiful druse is to be seen in the Duke of Brunswick's Museum of Natural History. It is a group of four-sided prismatic crystals, the greatest part of which have internally cavities of the form of a reed, and likewise four-sided. The crystals are but little transparent, and are dull

in the fracture ; I should reckon them among the crystallized hornstones. They are of various lengths, seldom an inch ; their thickness is up to the sixth part of an inch. On their four side-faces are sometimes found very thin tape-like elevations, smaller than the face itself, but always parallel with the figure of one of them, so that it sometimes appears, as if nature had meant to form crystals in the form of a cross. Both the ends of the crystals hold fast in the druse-holes, on which account their form cannot be ascertained.

Among the divers modifications of this flötz of agate is, in all probability, to be reckoned also the substance, No. 92. The matrix of it is, for the most part, calcareous earth, in which the siliceous earth usually appears as calcedony in irregular streaks. It is sometimes so closely connected with ferruginous argillaceous earth, that it passes, as a real red jasper, through the calcareous matrix in similar streaks.

This calcareous matrix appears under various forms ; in one place, as real marble, in another, as a yellowish splintering limestone ; elsewhere, in the nature of calcareous spar, and this last sort, when rubbed and polished, exhibits a curious variety of colours. This sort might, perhaps, be classed with those marbles of Sweden and Siberia, that give fire with steel, and which
Mr.

Mr. Kirwan, in his Mineralogy, under the head of *Limestone with veins of quartz*, calls *Saxum Sahlbergense*.

Just over the village of Sültzhayn, in the county of Hohnstein, there juts out under the substance, No. 75, a flötz of the sort now mentioned. Near under the mound-earth, very large pieces of ten, and more feet in length, are procured, which are used for door-sills and other purposes. The layer of this flötz is almost quite horizontal, and in the same line run also the layers of calcedony, which become visible only in the cross fracture.

Of the flötz of stone-coal I have not been able to make any part discoverable, and yet, in all probability, there must be at least something of it; but that tract is too much covered with mound-earth, and too little opened.

I must touch a little also upon the boulders of the agate kind, which are found in the flötz range at the southern foot of the Hartz mountains; among them the Espenberg, between Ilefeld and Königerode, is particularly remarkable. In a part of it are found quartz, hornstone, jasper, agate, the so called coral agate, and stillicidious calcedony and agate, in abundance. They are found likewise at Walkenried and Sachse, and in the latter place a sort of loose iron-stone (*leseeisenstein*), which used to be gathered

thered off the fields, and melted down at Zerenheerd.

These boulders are usually brought up with the plough from the earth, and it may be conjectured of them also, that they belong to the out-going (*ausgehenden*) of the abovementioned agate flötz. They lie quite under the copper-slate flötz, as appears particularly at Espenberg.

This is all I can say concerning the amygdaloid and agate flötze, to which I have to add, that, deep below, it constantly approaches more and more to pure trapp, after which, next follows a schistose flötz, which forms the covering (a foot and a half thick) of the stone-coal.

The stone-coal flötz is 18 inches thick at Netzwies, under Rabenstein, where it was formerly worked; at Vaterstein, near Neustadt below Hohnstein, where it is still worked, it is in some places up to 30 inches thick. It occurs here according to the manner usual in flötze, that are worked; its fall is towards the hours 9 and 10 to the southward; it has likewise its backs and alternations (*rücken and wechsel*), and very frequently near each other, so that I have found four alternations between two shafts (those of William and Albert), about forty toises asunder. At these alternations there is, for the most part, stone-coal, sometimes a soft and bad stone, and at times a hardened clay; all these substances

stances are sometimes accompanied with copper pyrites.

This stone-coal, with the exception of some small thin streaks of slate, is rather of a uniform nature, and properly belongs to the class of pitch-coal, as it burns without flame; a pure earth-pitch exudes from it in abundance, and in burning emits a bituminous and not disagreeable smell. No. 119 is a specimen of this coal; specific gravity, 1,580.

Under the coal is again a black slate, with impressions of reeds and herbs, 18 inches thick; then black trapp as above, which forms the deadlier of all the flötz layers. This is followed by the vein-range of the Hartz, which here consists of slate and grey-wacke.

For the sake of a more accurate general view, I now proceed to the complete arrangement of all the flötz-layers, that jut out (*ausgehenden*) one after another from Nordhausen to Ilfeld, and farther northwards over Ilfeld.

Lehmann, in his *Essay on the History of the flötz mountains*, has not only described, with sufficient accuracy, this order or series, but has also clearly exhibited it in profile, which delineation will serve to clear up such obscurities as may occur in my description, and to prevent the misconceptions, that might arise from my expression, *under the copper-slate flötz*. For no one will believe, that the stone-coal

coal flötz lies under that of copper-slate *in one and the same hill*; as their outgoings (*ausgehendes*) are 4500 paces asunder, and several hills lie between them. Accordingly I may give here Lehmann's account of these flötz layers, which is to be found also in Gerhard's History of the Mineral kingdom, almost in his own words, yet with some corrections.

I. Uppermost is mound-earth of various thickness; it is to be looked for on the highest points of the flötz mountains, ex. c. at the Hohnstein and Sachswerferberg; for, in other places it is found much farther behind. (Sandstone, also, is in that tract much farther behind.)

II. Swine-stone of the sort, whose various modifications I have described in the preceding chapter, about six toises thick.

III. Alabaster of very different thickness, from 4, 6, 10, 20, up to 30 toises; as, for instance, at the precipices of the Kohnstein, where it is visible.

IV. Coarse wacke (*rauhwacke*), consisting of sand, clay, and calcareous earth, from 12 to 20 toises thick.

V. Limestone, called *zechstein*; usually two toises thick.

VI. What is called *oberfäule*, that is, argillaceous

laceous earth, mixed with some calcareous matter and sand ; three feet thick.

VII. What is called *ueberschuss*, a thin flötz of potter's clay (*lettenflötz*), about an inch thick.

VIII. Soft rotten substance (*fäule*), consisting of argillaceous earth, mixed with some calcareous matter.

IX. The covering (*dach*), a grey calcareous argillite (*thonschiefer*) with, in some places, black dendrites, 16 inches thick.

X. A very poor copper-slate, called *Mittelberge*, six inches thick ; it is, for the most part, argillaceous earth, but looks as black as the good copper-slate.

XI. *Kamschaale*, a black slate, containing very little copper, an inch thick.

XII. Again, a sort of middle-slate like No. X. four inches thick.

XIII. The best copper-slate in the series, only one inch thick.

XIV. What is called *lier*, or sandy mineral (*sanderz*) ; the surface of the deadlier penetrated with bitumen and metallic (chiefly ochreous) parts, usually not worth smelting for more than an inch of its thickness. Otherwise this is the flötz of the

XV. *Lier*, full three feet thick.

These flötze appear, after removing a little
the

the loose earth, almost all at the long wall near Ilefeld.

XVI. Blue clay, from 2, 4, to 8 inches thick.

XVII. The tender dead (*zarte todte*), properly a red sandstone, a toise thick.

XVIII. The red *lier*, a strong red stone; No. 75 of the collection is a specimen of it. Entire mountains, such as the Herzberg and Kaulberg near Ilefeld, are composed of this stone. Veins of ironstone and brownstone run in it, as also in the following substance. The map will shew how far it extends;* it stretches in breadth above half an hour's walk, and it is difficult to determine the huge thickness of this flötz. According to the analogy with other substances of rocks one would take this for the real deadlier, and accordingly for the lowest flötz layer; but the following circumstances prove, that there are under it other layers, and even a flötz of stone-coal.

XIX. A sort of porphyry, somewhat like the preceding, but more corneous, and with some small iron garnets; No. 74 is a specimen of it. It never cuts off sharp from the former.

XX.

* I have not been able to distinguish it, on the map, from the substance, No. 74, and have marked it with the same colour, which I have given to the porphyries.

XX. Amygdaloid, No. 58 of the collection; likewise No. 57.

XXI. Also amygdaloid, with small agate balls somewhat more distinct; specimen, No. 56.

XXII. Brownish-red, liver-colour trapp, with balls of agate; specimen, No. 54.

XXIII. Grey-greenish trapp, with some balls of agate; specimen, No. 53; alternates with the following black trapp.

XXIV. Black trapp, which, in the neighbourhood of the two preceding sorts of stone, contains some small indistinct kernels of agate, that are quite lost at a greater depth; specimen, No. 52.

The sorts of stone mentioned from XX. to XXIV. border so much upon and into each other, that their peculiar limits and thicknesses cannot be assigned. The last one may be computed to be in some places 10 toises thick, while the others, taken together, may be from six to twelve feet.

In conformity with these four or five flötz layers, probably come forth those agate flötze, from which we have at Espenberg, near Walkenried and Sachse, the agate boulders; between Walkenried and Weida, the large agate nodules of the Langenberg; and at Sülzhayn the
marble

marble with streaks of calcedony, specimen, No. 92.

XXV. The covering of the coal ; a blue argillite, 18 inches thick.

XXVI. The stone, or pitch-coal, 18 inches thick.

XXVII. Black slate, with impressions of reeds and herbs, 18 inches thick.

XXVIII. Black trapp, the proper lie of the coal flötz and all the flötz layers.

XXIX. The vein-range of the Hartz, which here consists of grey-wacke.

From what has been said, it appears very clearly that the copper-slate flötz, and the coal flötz, must have been formed at very different periods ; the latter is certainly much older than the former, and the substances lying between them are older by far than those, which cover the copper-slate flötz.

I think now I may be excused for not giving further descriptions of the flötze, which have been sunk through at the foot of the Hartz mountains, as they do not differ essentially from those mentioned, from No. I. to No. XIV. although bearing different names.

I must also pass over several small varieties, which occur singly in these flötz ranges, as it would be impossible to bring them into a connexion

nexion with the whole ; as, for instance, the fat argillaceous earth, fit for making tobacco pipes, at the foot of the old castle of Rheinstein—the brick-clay, which is dug up at the foot of the Langeberg, between Harzeburg and Ockerhütte ; &c. &c.

CHAPTER III.

Petrifactions and remains of organized substances, from the flötz mountains.

AS little as I am enabled to arrange in a lithological order the remains of organized substances, that appear in the great and extensive district of the flötz mountains, such an arrangement would be equally little interesting to a great part of my readers. For, all the petrifications and remains of this sort prove directly one and the same thing. They are all indications of the wide sea, which formerly covered a great part of Germany ; and, in examining any of these fossils, it will not be easy to remove the veil, under which lies concealed the secret, whether it has been brought here by the deluge, or whether the North sea and the Baltic have gradually overflowed and raised the tracts, in which we find the flötz ranges with their manifold remains of organized substances. Yet from the great quantity of marine substances, which we find in them, it seems to result, that
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they were indigenous here, and not merely deposited by a passing inundation.

The chief characteristic of the petrifications from the flötz mountains is, that they have all a fresher and less shattered appearance than those from the vein-mountains, and that their being of a later production is easily perceivable. I shall here confine myself to a few remarkable specimens, which have been found in the flötze at the foot of the Hartz mountains; and the shells converted into calcedony, from Platenberg, at the foot of the Regenstein, near Blankenburg, No. 83 of the collection, deserve to be first taken notice of.

The Platenberg is a very flat hill, at the foot of the Regenstein, or Rheinstein. The sandstone, of which it consists, does not appear, at the surface, in the form of rocks; but the celebrated shells of the calcedony kind are found only in boulders of sandstone in the fields, according as they have been ploughed out from time to time. Were the land here not all cultivated, the position of this stone might be more accurately inquired into; but, at present, nothing more precise can be determined. Meanwhile the chief point is reduced to the so often asserted, and as often doubted, conversion of calcareous earth into siliceous earth; and certainly the easiest way to get over the explanation

tion of this singular phenomenon, in which shells, naturally calcareous, are at present of a siliceous kind, would be to admit, that calcareous earth can be converted into siliceous.

In the fifth volume of the writings of the Berlin Society of Naturalists, p. 321, &c. there is a Memoir on this subject, drawn up by Mr. J. C. Fuchs, in which also Mr. Walch's description of it is quoted from Vol. 4, p. 210. Yet I shall venture to give a different explanation of this so remarkable and rare phenomenon, founded on the nature of the stone, that encloses these shells.

The stone itself is a coarse-grained sandstone, whose connecting medium consists of a horn-like mass of calcedony, which often shows itself in the stone in rather regular streaks, and sometimes fills up little clefts that occur in it, and often forms the greatest part of the stone. Had the holes been caused by shells and their impressions, it is not to be wondered at, that they also, as well as the clefts, should be filled with the fluid mass of calcedony. We may explain in this manner the origin of all petrifications. In every real petrification of shells, the calcareous scales of the shell-fish must have been already destroyed, and every piece of this sort, which still contains any part of the unchanged scales, does not merit the name of petrification. Now, whereas in the usual petrifications

petrifications, in the calcareous mountains, we admit a filling up of the space, where animal scales formerly existed, by calcareous earth, why should we doubt, in the case of a siliceous range, that the space, formerly occupied by shells, not only might have been, but actually has been filled up with siliceous earth? All the echinites, and other scaly animals changed into flint-stone, which I have found in the sand tracts of the principality of Lüneburg, have, in all probability, been produced in this manner.

Were we, indeed, to find in a calcareous range shells changed into calcedony, the conversion of the calcareous scales into siliceous earth might probably be maintained with greater certainty. But we want, as yet, sufficient observations for this purpose; for, hitherto, the substances themselves have been more looked into than the bed where they lay.* I cannot, therefore, as yet
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* It is stated, that turbinites of the calcedony kind have been found at Courtaignon, and in Champagne; but I do not know, and wish to be informed, whether they have been found, as with us, in sand and sandstones, or in some other substance. They are found also near Bourdeaux, but their position is not described with sufficient accuracy so as to know, whether they actually stick in calcareous stones or not.

The shells of the calcedony and flint-stone kind, which are sometimes found in the flint-stones from the chalk hills of France and England, and impressed on them, do not afford

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subscribe to that theory, whereas my observations on the specimens, which I have before me, prove

any decisive proof, their being still some difference of opinion concerning the origin of these flint-stones. Some persons wish to deduce from them a conversion of calcareous earth into siliceous earth; others on the contrary assert, that the siliceous earth of the flint-stones may be gradually changed into calcareous earth. Should it be laid down, that in the mass, in which those chalk hills had formerly been in a fluid state, siliceous earth likewise might have been contained in a similar state (for in nature it is extremely rare to find a primitive earth quite pure and unmixed), I would be inclined to admit, that, when at length a deposition took place, both the calcareous and siliceous earths separated to a certain degree from each other, and each of them became coagulated by itself; and, whereas the latter was in a smaller proportion in the mass, accordingly it must appear in the chalk hills only in nodules.

The siliceous earth could not possibly separate itself quite pure, and without admitting some calcareous earth; hence the flint-stones contain a certain proportion of calcareous earth, which becomes visible, not only by the artificial decomposition in our laboratories, but likewise by the tedious and natural decomposition of nature. For it is well known, that flint stones, if long exposed to the air, become covered with a chalky coat, which effervesces with acids. But this cannot, by any means, be called a conversion of siliceous into calcareous earth.

Calcareous earth was thus intermixed in the siliceous earth of the flint-stone, but in the fine parts was so enveloped with siliceous earth, that it could not be discovered without decomposition. In the air, which is constantly active in the destruction of stones exposed to it, the siliceous earth of the flint-

prove too clearly, in my opinion, that no conversion has taken place.

When we find at present in sand, washed by the water, shells in which there is no animal, we generally, if not always, find the internal cavities filled with sand. They are usually calcined to a high degree, and in this state were probably our shells also from the Platenberg, that had been buried in the sand. The fluid mass of sand was penetrated by fine siliceous earth dissolved, or, if you choose, by a fluid mass of calcedony; and, according as it hardened, the sand was united with it, as clearly appears from the streaks in the stone. The calcined scales, accordingly, were penetrated by the same mass, and all the cavities of the turbinites were filled with it. By this means the alteration was effected, and the calcareous scales became silice-

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flint-stone was accordingly attacked by its corrosive powers; the calcareous earth, contained in the siliceous earth, was thus disengaged, in consequence of disintegration, and its aerial acid thereby became operative, and now wreaked its vengeance on the siliceous earth, which had for so long a time enveloped its corrosive powers, and kept them in a state of inactivity. The siliceous earth, being now attacked on two sides, viz. by the external air, and by the poison, which it carried in itself, (I mean the aerial acid of the calcareous earth) could not but submit to its fate, while, on the contrary, the calcareous earth, being more homogeneous with the corrosive power of the air, could not suffer so much from it as the siliceous earth.

ous, united with some of the calcareous earth of said scales.

The admixture of the calcareous earth is clearly perceived from this circumstance, that the shells now become siliceous are, by a greater degree of whiteness and opacity, very remarkably distinguished from the remaining more transparent pieces of calcedony, which are found near them, or even in the cavities within the shells. Were the shells filled with sand, the mass of calcedony, soaking through, could do no more than penetrate through the sand, and unite it together in stone. But, if they were not full of sand, but hollow, in that case, supposing a sufficient aperture in the calcined scales, and a sufficient supply of the fluid mass of calcedony, this must have soaked through, or it might have flown in through the little openings or holes, which are often found in calcined shell-scales, and filled up the interior.

That moisture can soak into calcined shells, and penetrate through them, appears from the strong adherence of such shells to the tongue, which shows how apt they are to attract all sorts of moisture. Should then moisture, containing siliceous earth dissolved, be less in a state to insinuate itself into a shell rendered porous by disintegration (*verwitterung*)? This seems to me scarcely credible; and I rather think,

think, that it could filtrate into the interior cavities of a shell, if even there was no hole in it; for I have a specimen before me, in which a small stalactitic cone of calcedony has been formed, and also a similar specimen of a petrified turbinite, in whose inner cavity the calcedony has placed itself in its usual form of nodules, which to me proves the total want of an aperture in the shell-scales, and a weak oozing of the mass of calcedony through the fine pores of the calcined scales. In another specimen lying before me, the inner cavity of a turbinite is overlaid with very fine and neat quartz crystals, and in this case the quite pure siliceous earth alone could filtrate through the shell, within which it has crystallized.

I have also a specimen, in which one half of the turbinite scales is not yet altered, and remains so completely in its calcined state, that it effervesces with acids. The shell was, in all probability, not as yet calcined, when it became enveloped in the sand, that had been passed through by the fluid siliceous earth and a little clay, or, more properly speaking, by the fluid mass of calcedony. Accordingly the fluid siliceous earth could not penetrate into the still hard and uninjured scales, and the calcination of them must have taken place after the hardening of the mass of calcedony, and probably at the
time

time when the stone, of which I am speaking, was exposed to the air and weather. To the same cause, (viz. that, at the time of the hardening of the mass of calcedony, some shells were neither as yet calcined, nor filled with sand) are probably owing the impressions of hollow turbinites, which we find at times in some specimens, in which not only calcination, but likewise total destruction must have preceded the time, at which these stones were exposed to the weather.

I must request the indulgence of those, who have got the collection of specimens, for not having been able to give them, in the manner I wished for, the pieces classed under No. 83, as I have now described them. It was impossible for me to do so, as the ground was not sufficiently opened, and I must be content with having found the pieces necessary for my own instruction, and for giving my opinion on this subject. I hope, however, that those, which they have received, will be sufficient to explain what has been said.

I shall just mention the petrified wood, which is found in the Kiffhäuserberg, merely to refer the reader to Mr. Charpentier's Mineralogical Geography of Electoral Saxony, in which is given a copious description of these remarkable petrifications; for, were I to describe them, I should

should go too far from the foot of the Hartz mountains.

Treating of the petrifications of the sandstone flötz, I must not omit the impressions of leaves, which sometimes occur in the sandstone quarry of the Heydelberg, near Blankenburg. According to the opinion of some mineralogists, they are not to be reckoned among the remains of organic substances of a former world ; whereas they think they have observed, that the sandstone, being mixed with clay, and somewhat ferruginous, becomes reduced, in the air, into sand ; and that the leaves, that fell from the adjoining hazle trees, were mixed among it, and that afterwards, when removed from the contact of the open air, it hardened again into sandstone. I will leave it to be considered, what grounds there are for this opinion, and how far it is founded on experience and observation ; but, as likewise *conchae marinae* and *echinites* are found there, much might be said pro and con.

I pass over the many and divers petrifications, that occur in the calcareous range ; but, having said something of the flötz range from the North sea, and the Baltic downwards, I shall merely make mention of the *encrinites*, or lily-stones, partly with pedicles from 8 to 10 inches long,

long, which are found, as great curiosities, four miles (German) to the north of the Hartz.

I have not seen the petrifications of fishes in oolite stones, of which Mr. Schröder speaks, pag. 10 of his book on the Brocken.

In the gypsum range no real petrifications have been found as yet, but there have been met with some not less remarkable calcined remains of a former world ; for example, at Düna, fragments of unknown monstrous large bones of animals, mentioned by Counsellor Michaelis, of Marburg, in the Göttingen Magazine, and other bones, which our osteologists consider as those of two old and one young rhinoceros. See, on this subject, Mr. Hollman's plate and description in the Commentaries of the Göttingen Academy of Sciences for the year 1752 ; part 2.—Göttingen, 1753.

In the mineral museum of Count Von Stolberg-Werningerode are the horns of a stag, which were found in a gypsum quarry, near Werningerode, and are described in the fourth volume of the Papers of the Society of Naturalists of Berlin, page 307.

I must say a few words concerning the impressions of fishes in the flötz of copper-slate. They usually come to light, sprinkled over with pyrites, on splitting the copper-slate, and the impressions appear on both halves. Only seldom
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we find on one half a little elevation of the fish, which causes a depression in the other half; sometimes the scales, tail, and fins, are very clearly marked, and kept up. They all lie on their sides, and somewhat curved, as if they had been endeavouring to rise out of the mud, in which they had sunk, and to catch at the water. Their heads are almost always much distorted by the flat compression, and therefore the mouths are often open.

The fishes are almost all of one sort, and, in fact, the same as the impressions of fishes, mineralized by cinnabar, from Münsterappel, in the county of Greweiler, described by Mr. Collini; they all seem, according to Lehmann's opinion, to belong to the class of fresh water fish. Of undoubted sea fishes, which have indeed been found in other flötz ranges, I have not seen a single specimen among the slates from the foot of the Hartz mountains.

The stone-coal flötz, which lies deep under that of the copper-slate, is not free from remains of organized substances, but both the upper, and particularly the lower part, are often full of impressions of herbs, sedge, and sorts of grass. When the stone-coal flötz under Rabenstein, near Ilfeld, was still worked, there used to be found the most beautiful impressions of herbs and flowers; at present no more of them is to

be met with. Lehmann mentions the *flores*, *asteris praecocis*, *pyrenaici folio*, *salicis flore luteo*, which were so perceptible, that the impressions of the stamina and apices could be clearly observed on the inner disk.

I shall just mention the leaves and veins of firs, which have become ironstone, from the foot of the Rammelsberg, merely for the sake of a general view, this being not the place to treat of them, as I am now speaking of the substances of the former world; this observation applies also to the wood penetrated by iron, and changed into ironstone, from the Alten-Mann of the inner Rammelsberg, and to the wood incrustated with cement-copper (*cementkupper*), -of which I have seen some specimens.

P. S. I well know, that the time is not as yet come for arranging minerals according to their respective ages. The annexed table must, therefore, be considered only as an attempt, which probably may be rectified hereafter, in consequence of further observations on a range of mountains more widely opened.



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MOUNTAINS CO
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Trapp

11. 12. 27. 73. 43.

Schistus

Grey Wacke and Sands

23. 22. 24. 25. 26. 28. 38. 39. 29. 30. 31. 32. 40. 41. 42. 33. 35. 34. 36 { 85. } 19. 20. 21. 17. 14. 15.

The older

53.
54. 55.

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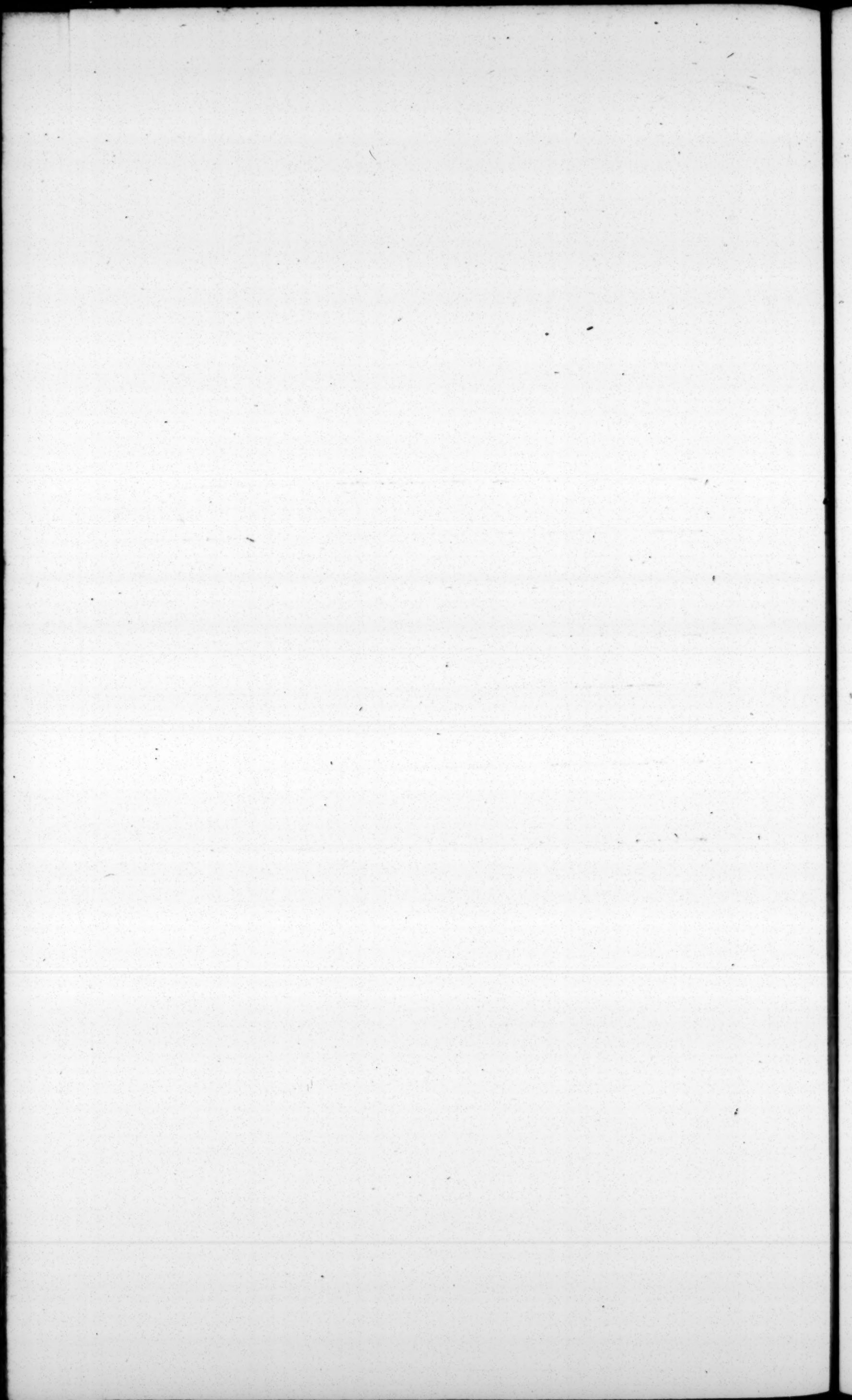
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TABLE

OF THE HARTZ MOUNTAINS CONSIDERED WITH
THEIR RESPECTIVE AGES.

OR PRIMITIVE RANGE.

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FIRST REPORT
OF THE
COMMISSIONERS

APPOINTED TO
ENQUIRE INTO THE NATURE AND EXTENT OF
THE SEVERAL

BOGS IN IRELAND,

AND THE

Practicability of Draining and Cultivating them.



DUBLIN:

PRINTED BY GRAISBERRY & CAMPBELL, BACK-LANE.

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1810.

REPORT

COMMISSIONERS

IN THE MATTER OF THE NATURE AND EXTENT OF

BOOKS IN IRELAND,



FIRST REPORT

Of the COMMISSIONERS appointed to inquire into the nature and extent of the several BOGS in IRELAND, and the practicability of Draining and Cultivating them.

THE warrant under which we are appointed Commissioners having been issued on the fifteenth day of September, 1809, we assembled in Dublin on the 19th day of the same month, and after having taken the oath prescribed, proceeded to form a plan for the execution of the trusts reposed in us by the Legislature.

We considered it a fortunate occurrence that shortly previous to our appointment, Mr. Rennie had been in Dublin, and although his engagements in England precluded us from having an opportunity of formally consulting him at our Board, yet we found that two of the Commissioners had had the fullest communication with him on the subject of our commission, and conceived themselves to be in full possession of his ideas on the subject.

After committing to paper the outlines of such instructions as appeared to us to be necessary for the guidance of our Engineers, and conformable to Mr. Rennie's ideas, we consulted different Engineers and Surveyors as to the practical execution of it in detail; and finally, reduced the whole into the form of "*the Instructions*," which form the first article of the Appendix to this Report.

The execution of our commission demanding considerable accommodation and space for the maps, sections, and instruments necessary for the investigation of the subject committed to us, it became an object to obtain the permission of the Dublin Society to hold our meetings in their house, and they (with the liberality which ever distinguishes them

when the improvement of Ireland is the object) immediately acceded to our request.

On our part, with a view to economy, we appointed their assistant Secretary to be the Secretary of our Commission, and the superintendant of their repository, his assistant clerk. To the former we gave a salary of £200 per annum; to the latter, one of 50 guineas, and these two sums amounting in the whole to £256 17s. 6d. form the entire annual expence of our establishment.

Our next object (and on the due attainment of which depended in a great degree the success of our undertaking) was the proper division of the bogs of Ireland into the districts referred to in the first article of the instructions, and further to determine in what part we should first apply those means intrusted to us, and which we at once perceived were utterly inadequate to the execution of any plan that should embrace the entire extent of Ireland.

In forming our opinions on these points, we derived our principal assistance from the great ordnance survey of Ireland, executed by General Vallancey, the Chairman of our Board, it being the only map which defines either the situation or boundaries of the bogs with any tolerable accuracy.

From inspection of this map, we were enabled to consider the greater part of these bogs as forming one connected whole, and to come to the general conclusion, that a portion of Ireland of little more than one fourth of its entire superficial extent, and included between a line drawn from Wicklow head to Galway, and another drawn from Howth head to Sligo, comprises within it about six sevenths of all the bogs in the Island, exclusive of mere mountain bogs and bogs of less extent than 500 acres—in its form resembling a broad belt drawn across the centre of Ireland, with its narrowest end nearest to the capital, and gradually extending in breadth as it approaches to the western ocean. This great division of the island extending from east to west is traversed by the Shannon from north to south, and is thus divided into two parts; of these the division to the westward of the river, contains more than double the extent of the bogs which are to be

found in the division to the eastward; so that supposing the whole of the bogs of Ireland (exclusive of mere mountain bog, and of bogs under 500 acres,) to be divided into twenty parts, we shall find about seventeen of them comprised within the great division we have now described, twelve to the westward; and five to the eastward of the Shannon, and of the remaining three, about two are to the south, and one to the north of the Division; of the positive amount of their contents we have as yet no data that can enable us to speak with any precision, but we are led to believe, from various communications with our engineers, that the bogs in the eastern division of the great district above described, amount to above 260,000 English acres, which on the proportion already mentioned would give rather more than one million of English acres as the total contents of the bogs of Ireland, excluding however from consideration mere mountain bogs, and also all bogs of less extent than 500 acres, of each of which description the amount is very considerable; of the extent of the latter some idea may be formed from a fact which we have learned from Mr. Larkin, that in the single county of Cavan which he has surveyed, there are above ninety bogs containing in the whole 17,600 English acres, but no one of which contain more than 500.

Most of the bogs which lie to the eastward of the Shannon, and which occupy a considerable portion of the King's county and county of Kildare, are generally known by the name of the Bog of Allen. It must not however be supposed that this name is applied to any one great morass, on the contrary the bogs to which it is applied are perfectly distinct from each other, often separated by high ridges of dry country, and inclining towards different rivers as their natural directions for drainage, and so intersected by dry and cultivated land, that it may be affirmed generally there is no spot on these bogs (to the eastward of the Shannon) so much as two Irish miles distant from the upland and cultivated districts.

With this first and general view of the subject, we had no hesitation in selecting at once the whole of the eastern

portion of the great district above referred to, as the object of our first enquiries, forming in itself one whole, whose parts had more or less connection with each other, lying in the centre of Ireland, in the immediate vicinity of some of the richest and best cultivated counties, intersected also by the two great lines of navigation, the Grand and the Royal Canals, and presenting in common apprehension, very considerable obstacles to improvement, the overcoming of which would in itself demonstrate the practicability of the improvement of the bogs of Ireland in most other cases.

We were further induced to form this selection on the general principle of beginning at the end of the great division above referred to, which lies nearest to the capital, and proceeding gradually to its termination at the Western Ocean; not however, considering ourselves precluded from making occasional exceptions where particular circumstances might appear to require it.

The proportion which the bogs in this district bear to the entire of the bogs in Ireland, appeared to us a further inducement, and we are the more disposed to mention this, as we find that to some we have appeared to have embarked in the first instance, on too great a scale; on this we shall merely observe that, having two years allotted to us for the duration of our commission, we undertook at once rather less than one third of our task, in the supposition that it would require about eight months for its execution.

Having determined to give in charge the whole of this district, it became the next object of our consideration, on what principle we should subdivide it into the smaller districts referred to in the first article of our instructions, for the purpose of being assigned to separate Engineers.

Major Taylor's excellent map of the county of Kildare, furnished us with every necessary information so far as that county was in question, but of the King's county there was no map published, and as it contains not less than 124,000 English acres of bog, it became a most important object to possess ourselves of the necessary information with respect to them.

We therefore thought ourselves fortunate in finding that Mr. Larkin, a surveyor of eminence, had surveyed the county for the Grand Jury, and we contracted with him to furnish us with a map of it on the large scale required by our instructions, and Mr. Larkin making himself responsible for the accuracy of the survey, we agreed to give him for it £300, being at the rate of less than three farthings per acre, for every acre of bog it contained: with these and the assistance of other documents, we divided all the bogs, containing above 500 acres in the counties of Kildare, King's county, Tipperary, Westmeath, and Longford, into seven districts—of these we gave the one which forms the north eastern part of the bog of Allen, in charge to Mr. Richard Griffith, the south eastern to Mr. Brassington, the north western to Mr. Townsend, the south western to Mr. Longfield; a district lying principally in Westmeath, to Mr. Jones, and the bogs in the county of Longford and on both banks of the river Inny, to Mr. Edgeworth.

We also gave a large district of bog in the county Tipperary, which runs nearly parallel to the line from Roscrea to Cashel, in charge to Mr. Aher, wishing to take advantage of the circumstance of his being able to give a portion of his time to that district, although not to any other, on account of his other engagements.

We next laid down the principles which were to govern our expenditure, in order to secure that the amount of our disbursements should depend in every instance on the degree of labour to be performed.

With these views, we fixed the pay of Engineers at two guineas a-day for each day actually employed, and one guinea a-day in lieu of allowances for travelling and board and lodging: that of their Surveyors at one guinea a-day for each day actually employed, to be at once their pay, and in lieu of all allowances of every description—for the staffinen, chainmen, and labourers, we entrusted the Engineers to make the best bargains in their power, not exceeding three shillings per day, in any instance, and these terms we trust, will appear extremely moderate when compared with those usual in Great Britain, and considering the hardships attendant on this peculiar set-

vice. The appointment of the Engineers we necessarily hold in our hands, and select them under the obligation of our oaths ; the appointment of the Surveyors we commit entirely to the Engineers, holding the latter responsible for the qualifications of the persons they employ.

We account with every Engineer once a week, and he makes his return to us upon his oath.

To give an idea of the scale and nature of our expenditure, we subjoin as the second and third articles of our Appendix, copies of accounts already called for by your Honourable House.

The winter season having set in almost immediately after the appointment of the Engineers, and which is particularly unfavourable to the execution of the survey, we have as yet received but one of their Reports, although they are most of them, we believe, in a state of considerable forwardness.

This Report we have determined on laying at once before your Honourable House, considering it as sufficient in itself to enable the public to form a pretty accurate opinion of the degree of information which may be expected from the execution of our Commission, and feeling also, that if we deferred it any longer, we should have no other opportunity before the opening of the next Session ; we have accordingly subjoined it as the fourth article of the Appendix to this Report.

The District reported on contains 36,430 English acres of bog, and forms the eastern extremity of the bog of Allen. The map furnished to us by Mr. Griffith, is on a scale of four inches to an Irish mile, and is accompanied by Sections of the bog to the extent of nearly two hundred miles

As these maps and sections could not be engraved without enormous expence, we have subjoined to this report a map executed on a scale as much reduced as is consistent with clearness, and which scale we propose to apply universally in the different maps which in the execution of the Commission it will become our duty to furnish to your Honourable House, and this map we have accompanied with three lines of sections of the bog, to serve at once, as specimens of the

manner in which the sections are executed, and to convey a clearer view than could be expressed in words, of the internal structure of a great Bog; a view, we believe materially different from any of those generally received.

There are many, we believe, who consider the bogs of Ireland to be low and marshy tracts of country, not very dissimilar in their composition from the fens of Lincolnshire. Others, aware that the substance of which they are formed greatly differs from that of the fen district, attribute, nevertheless the origin of both to pretty nearly the same causes; while an opinion more prevalent, and perhaps not less erroneous than either of the foregoing, attributes their formation to fallen forests, which are supposed at some former period to have covered these districts, and to have been destroyed either by the effects of time, or by hostile armies in the early wars of Ireland.

The facts stated in Mr. Griffith's Report are obviously inconsistent with any of these suppositions; the bogs which he has surveyed lying every where in elevated situations; and the trees which have hitherto been so constantly found buried in the edges of these bogs, (where alone it is probable they have generally been sought for,) being very rarely found, in the interior, at least in this district.

Without entering in this Report into any enquiry as to the origin of peat bogs, we are, however, anxious to give to such persons as have not had an opportunity of examining them, some idea of the general appearances which they actually present.

It appears, from Mr. Griffith, that each of the four bogs included in the subject of his Report, is a mass of the peculiar substance called peat, of the average thickness of twenty-five feet, and no where less than twelve, nor found to exceed forty-two; this substance varying materially in its appearances and properties, in proportion to the depth at which it lies; on the upper surface covered with moss of various species, and to the depth of about ten feet, composed of a mass of the fibres of similar vegetables in different stages of decomposition proportioned to their depth from the surface; generally, however, too open in their texture to be applied to the pur-

poses of fuel ; below this, generally lies a light blackish brown turf, containing the fibres of moss still visible, tho' not perfect, and extending to a further depth of perhaps ten feet. Under this, in the instance exhibited in the Section at the close of Mr. Griffith's Report, are found small branches and twigs of alder and birch, but we do not understand him as being of opinion that such is by any means generally the case ; at a greater depth the fibres of vegetable matter cease to be visible, the colour of the turf becomes blacker, and the substance more compact ; its properties as fuel more valuable, and gradually increasing in the degree of blackness and compactness proportionate to its depth ; near the bottom of the bog it forms a black mass, which, when dry, has a strong resemblance to pitch or bituminous coal ; and having a conchoidal fracture in every direction, with a black shining lustre, and susceptible of receiving a considerable polish.

We have requested Mr. Griffith to make a chemical analysis of these different Strata, which he has done in the laboratory of the Dublin Society ; and an account of which, with the section above alluded to, forms the Appendix to his report. Immediately below this lower stratum there is generally found a thin stratum of yellow or blue clay, varying in thickness from one to six feet. In some places the peat rests on a thinner stratum of yellowish white marl, containing on an average about sixty per cent of calcareous matter. This stratum of clay in this district universally rests on a solid mass of Clay and Lime-stone gravel mixed together, and extending to an unknown depth.

We should further consider the peat mass as partaking in a general nature of the property of sponge completely saturated with water, and giving rise to different streams and rivers for the discharge of the surplus waters which it receives from rain or snow. These streams in this district almost universally have worn their channels through the substance of the bog, down to the clay or lime-stone gravel underneath ; dividing the bog into distinct masses, and presenting in themselves the most proper situation for the main drains ; and which, with the assistance of art, may be rendered effectual for that pur-

pose. Such is the internal structure of the bogs in this district. Viewing them externally, they present surfaces by no means level; but with planes of inclination amply sufficient for their drainage. The highest summit of any part of the bogs in this district is 298 feet above the level of the sea, taken at an ordinary spring-tide in the bay of Dublin; while the lowest point any where on their surface is 84 feet lower than the highest, and therefore 214 feet above the level of the sea.

It requires a mere inspection of the map and sections, to be convinced, that there is no part of these bogs from which the water may not be discharged into the rivers in their immediate vicinity, and with falls adequate to their drainage: and we observe, that in the instance of the bog of Timahoe, a part of its water is discharged into the sea at Drogheda and another part below Waterford.

It is now our duty to report on the probable expence of the proposed operations, and if we are conscious of the general fallacy of estimates, we must be peculiarly so in the case of works so novel as those which form the subject of our Report.

We have therefore required the estimates to be given in to us in their most minute details, and we have the satisfaction to observe, that the data on which Mr. Griffith's estimate is formed, are taken from the expences of works executed by the Grand Canal Company in these very bogs. This Company has had abundant experience of the extent of the expence of every variety of drains, excavations and embankments necessary for draining the bog, preparatory to the carrying their canal through it; and we know Mr. Griffith to have had access to their accounts, and that it is with the full knowledge of them, as well as of other sources of information, that he has made his calculations.

It is Mr. Griffith's opinion that by the main drains laid down in the situations referred to in the map, and with a system of minor drains discharging their waters into the main drains, and at a general distance of one fourth of an Irish mile from each other, and further, with a system of cross drains dis-

discharging themselves into the minor drains, and at a distance of 280 yards apart, the entire bog may be rendered sufficiently compact for the commencement of agricultural operations. The cost of the different improvements proposed in the rivers, and of the main and minor drains, he estimates at.....£49,268 0 0
 And of the cross drains at.....£20,746 0 0

making altogether.....£70,014 0 0

as being the expence of discharging the waters from these 22,490 Irish acres, equivalent to 36,430 English acres of bog, sufficiently to enable the farmer to commence his operations on them. In this view of expence, it is, however, particularly worthy of consideration, that there is a further extent of no less than 4,000 Irish acres, not of bog, but of good land lying along the banks of the rivers whose course it is proposed to improve, and the expence of improving which is included in the £70,014. These 4000 Irish acres appear to be at present covered with water for not less than half the year, and to set at an average rent of less than 30 shillings per acre; while the uplands in the immediate vicinity set for not less than 3 guineas. In the opinion of Mr. Griffith, these low lands, if preserved from these inundations, would become more valuable than the uplands. Supposing them, however, to receive an increase of only 20s. per acre in their annual value, and estimating this increase at 20 years purchase, an improvement would be effected to the value of £80,000 which is more than sufficient to cover the entire expence of the proposed drainage, not merely of these inundated lands, but of the bogs also. So that if the operation were to be carried into effect, and considered in a general view, it would appear that the profit of recovering these 4,000 acres of inundated lands would be more than equivalent to defray the entire cost both of their own reclamation, and of the drainage of all the bogs in this district. Whatever, therefore, might be the increase of improvement which the entire extent of bog might receive from the drainage, would be every part of it, so much of clear gain resulting from the adoption of the operations suggested by Mr.

Griffith. The dimensions recommended by Mr. Griffith for the main drains are a breadth of fourteen feet at top, and of two feet at bottom, and a depth of twelve feet; for the minor drains a breadth of nine feet at top, one foot at bottom, and a depth of eight feet; and for the cross drains a breadth of six feet at the top, one foot at bottom, and a depth of five feet.

Adverting to an opinion which some may entertain, that the breadth recommended for the bottom of these drains is not sufficient, Mr. Griffith observes, that it has been found by experience in the bogs passed through by the Grand Canal, where there was any fall, that deep drains with narrow bottoms were kept clear at bottom by the running water; but that the contrary was the case where their bottoms were made broad, as the same quantity of water being thinly spread over the bottom in the latter instance, was not sufficient to carry off the particles of peat which it contained, but deposited them on the bottom of the drain, which on this account required frequent scourings.

The mode in which Mr. Griffith proposes to construct these drains, so as to obviate as much as possible the tendency of the sides to collapse, deserves particular attention; not merely on account of the simplicity and ingenuity of the principle, but as possessing the recommendation of having answered on the trial which it has received in the different works undertaken in these bogs by the Grand Canal Company,

We beg to be understood as by no means pledging ourselves to an opinion, that in all cases, such drains and in the same proportion, would be sufficient to discharge the waters of a great bog. It is a point on which we wish to reserve the expression of our own opinion until we shall have had an opportunity of comparing the opinions of our other engineers. We consider the enquiry referred to us as divisible into two general heads; namely, the practicability of draining the bogs of Ireland; and secondly, of cultivating them when once drained. In a subsequent Report, we shall feel it our duty to enter fully into the latter consideration. Hitherto our views have been more directed to the former: since, if the drainage should appear to be either impracticable, or attainable only at an expence dis-

proportioned to the object, the latter enquiry would become of little moment. At present we shall merely observe, that we believe there is hardly a part of Ireland in which the evidence of facts does not furnish the most complete refutation of the opinion, that a drained bog is not susceptible of the excitement of manure.

On this Mr. Griffith observes to us: " In answer to an assertion made by some persons, that a bog deprived of water is a caput mortuum on which no plant will vegetate, either spontaneously or by any alteration in the composition of its surface that can be effected; it may be observed, that although bog, when first drained, appears to have lost the power of supporting aquatic plants, without a capability of supplying food for the vegetation of plants of a different or more useful nature, still if we have patience till the bog-moss,* &c. which composes the upper surface of the bog, shall have subsided, and by the near approach of their mossy fibres (which when alive are kept asunder by water) and exposure to the atmosphere, shall become (to a certain degree) putrid will be found that various grasses of good quality, and even white clover, will vegetate spontaneously on its surface.

But it is not to be supposed, that an active people will thus suffer nature unassisted, slowly to attain a desirable alteration in the upper surface of drained bogs. They will naturally join hand in hand with her, and by the simple process of digging or ploughing up the surface of the drained bog, and by gathering it into heaps, and (in dry weather) setting fire to them, (having previously mixed a portion of clay amongst the heaps which is always to be found in inexhaustible quantities beneath the bog,) accomplish in two years what nature unassisted, might have attained less perfectly in ten."

* *Sphagnum Palustre*. The pulp of the bog, as has been already observed, composed of varieties of this moss to exemplify as far as possible the various stages of decomposition which the moss has undergone, between the top and bottom of a deep bog, I have added, at the end of this Report, a Section, with a description and analysis of every variation in the colour and composition of the moss from the top to the bottom of a bog of 32½ feet in depth."

A prejudice much more extensive than that of the irreclaimability of a drained bog, is an apprehension which we have found very generally entertained, that in the event of the success of these operations, the country would be left without a sufficient supply of fuel. It seems not to be generally understood that if the bogs of Ireland could be reclaimed, we should derive, not merely the advantage of cultivating their surface, but, at the same time that the power of applying them wherever necessary for fuel would be increased some hundred, or rather some thousand fold. Fuel can at present be attained only from the edges of these bogs: the excessive wetness of their interior rendering it in its present state wholly unavailable for fuel. But, if once drained, fuel might be procured from every part of them; and it is a great mistake to suppose, that the drainage of a bog would impair its qualities as turf. On the contrary, it would operate as the greatest possible improvement of it; and that not merely at the time when it was effected, but at all future periods, and in a degree progressively increasing

And we are further convinced, that those who apprehend a scarcity of turf fuel, have formed a most erroneous comparison between any possible demand which could arise and the certain power of supplying it. It appears, by Mr. Griffith's report, that the entire proportion of bog in this district already exhausted by the supply of fuel, amounts to no more than acres, that is less than one thirty second part of its whole extent.

And further, if these bogs ever should be reclaimed, if it should indeed become more desirable to use them for fuel than for cultivation, we may be certain, that the profit inseparable from that circumstance, would insure that such would be the application. It may reasonably be supposed that the effect would be, that so small a proportion as might be necessary for fuel would continue to be applied to that end, and that the remainder would be no less profitably employed for the purposes of agriculture.

It was our wish to have stated the rate of expence per acre, at which the survey is conducted under our direction, a point, however, which we find it impossible to ascertain until

we shall have received Reports from our different Engineers. Most of the surveys in the districts between Dublin and the Shannon are already far advanced towards completion; and we expect at the commencement of the next Session to be enabled to report to your Honourable House upon the whole of the eastern portion of the great Division of Ireland, included between the lines mentioned in the first part of our Report, accompanied with a skeleton map, shewing the connections of the districts. In proportion as they shall be completed we shall send forward the engineers who have been employed in them to districts more remote; and proceed as fast as the means which may be entrusted to us will permit, in completing the survey of the remaining bogs in Ireland.

Dublin Society House,
June 16th, 1810.



Charles Vallancey.

J. Leslie Foster.

William Gore.

Henry Hamilton.

Richard Griffith.

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